VOL. 80 No. 2049
OCTOBER 18 1958

Telephone: FLEet Street 3212 (26 lines)
Telegrams: Allangas - Fleet - London

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midland Office
Daimler House, Paradise Street, Birmingham. [Midland 0784-5]

Leeds Office
Permanent House, The Headrow, Leeds 1. [Leeds 22601]

Scottish Office
116 Hope Street, Glasgow C2. [Central 3954-5]

IN THIS ISSUE

Annual subscription is: home, 52s 6d, overseas, 60s, single copies 1s 6d (by post 1s 9d)

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

CHEMICALS IN FTA

BRITISH chemical manufacturers can be justly proud of the efforts that their association has made in trying to resolve the deadlock over the negotiations for the proposed European free trade area. The stumbling block through months of patient negotiations has been the fears of some countries that chemicals originating from outside the Area might enter the one FTA country from another at enhanced values with very little processing carried out within the area.

This fear and others have clouded negotiations and threatened to halt progress for a considerable time. A sub-committee of the ABCM FTA committee was set the task of devising a means of defining origin that would be both workable and fair to all the countries concerned. Weeks of detailed study followed before Mr. Bernard Hickson, ABCM chairman, was able to announce at the annual dinner last week (see page 631 for report) that such a scheme had been approved by the association.

This scheme has also been approved by the Board of Trade and the UK Customs Departments concerned. A number of European chemical associations have also greeted it with approval; all the associations in the countries of the Common Market, except France, have greeted it with sympathy and understanding. There can be no doubt that thanks to the initiative of the Association of British Chemical Manufacturers, there is now a distinct possibility of an important break of the long impasse on the FTA negotiations.

That is not to say, of course, that the difficulties are likely to be surmounted overnight. What the ABCM has done, however, is to provide a formula that should enable future discussions to be more productive. The suggested procedure is too complicated for discussion here, indeed since it is to be the subject of further talks in Paris shortly, it would be unwise to attempt to probe it too deeply. Briefly, however, it provides for definition of origin by process criteria—that is to say that the amount of processing undertaken on chemicals imported into one FTA country before transit to another will be the deciding factor and the processes required to be carried out are so defined as to ensure that in all but a few cases the equivalent of at least a 50 per cent value added in the final product. This should avoid serious deflections of trade.

Initially, the sub-committee has concentrated on organic chemicals and is now helping to devise process criteria for other sectors of the industry, such as dyestuffs, plastics, fertilisers, tar products, etc. It is particularly significant that the conception of process criteria as a formula for definition of origin is considered acceptable and workable by the UK Government Department concerned. It is also distinctly encouraging that it has been received sympathetically by the great majority of West European associations of chemical manufacturers.

It is obvious that the British chemical industry has taken great trouble to meet the objections to the proposed free trade project on a basis that is fair and reasonable to all; it is to be hoped that it will be received by all the countries concerned in the same spirit. If that is the case, then the negotiations to be resumed within OEEC could mark a positive step towards

economic integration in Europe, for there is no doubt that a scheme of this nature is as vital to the wellbeing of its Common Market as it is to the wider FTA as a whole.

US FOREIGN INVESTMENTS

THIS publication has indicated more than once over the past two years that the UK and Europe would see the start up of more US subsidiaries and foreign branches. A recent US Commerce Department Office of Business Economics Survey indicates that the increase last year of $3.1 billion, in direct investments by US companies in foreign branches and subsidiaries is $300 million more than in 1956, the previous record year and almost double the increase in 1955. The indications are that US direct foreign investment will continue to rise for 1958, although at a somewhat slower rate. The increase in investments during the first half of this year is stated to be much lower than in the same period of last year.

Of the money invested by the US overseas last year, seven-eighths went to countries in the Western Hemisphere and Western Europe. Latin America's share was almost 40 per cent of the total, a rise of more than 50 per cent over the previous year. Investments in Mexican manufacturing industries increased by $63 million over 1956, and in Brazil investments for increased plant capacity are recorded as being up by $45 million. In Canada, however, US investments in manufacturing industries were slightly below the 1956 record, since earnings dropped as recession set in. However, the Commerce Department Office's survey shows that capital outflows from the US to Canada increased.

Earnings of US-owned manufacturing plants totalled $850 million in 1957, a sum a little below the 1956 figure. Earnings in Canada, it is noted, were down substantially due to the recession there. In Europe, however, US earnings rose sharply and big gains were recorded in Australia and the Union of South Africa. It is in these parts of the world that more will be heard of US investments.

NEW SUPERCONDUCTORS

URANIUM has yielded a new 'family' of compounds which are superconductors. The superconductors are characterised by a remarkable ability of permitting an electric current, once started in them, to flow in undiminished strength forever. The discovery was made by two research workers at Westinghouse Research Laboratories, New York, US, Dr. B. S. Chandrasekhar and Dr. J. K. Hulm, during research on the electrical resistance of uranium alloys at temperatures less than one degree above absolute zero and $-459°F$.

Superconductivity is among the most startling phenomena in all physical science. It occurs in various metals and alloys at very low temperatures. For reasons that are not now well understood, the electrical resistance of these materials suddenly drops to about one-millionth of one-billionth of its normal value. Electric currents flow in them undiminished and apparently forever. The practical importance of this behaviour if it could be made to occur at reasonably high temperatures is readily realised for such superconductors would make possible electrical and electronic devices not now even visualised.

The new superconductors include the first ever known to contain manganese and iron, two elements that have been considered alien to the existence of superconductivity. All are alloys of uranium and one other metal.

Measurements of electrical resistance were made on uranium-molybdenum and uranium-niobium alloys that had been stabilised in crystal structure by heating to 1,650° F for 24 hours and rapidly quenching in water.

It is reported that the alloys showed surprising temperature-resistance behaviour. Contrary to all known alloys, their electrical resistance became progressively larger as the temperature was decreased all the way down to one or two degrees above absolute zero, at which temperatures they become superconductors. Correlation of the superconducting and resistivity data is also stated to have thrown new light on the electronic structure of the atoms making up the alloys.

To probe more deeply into the superconducting behaviour of uranium alloys, the Westinghouse researchers then studied a group of 'intermetallic compounds.' Such compounds form when uranium is chemically combined with such metals as aluminium, manganese, iron, cobalt and nickel. It was from these studies that the completely new superconductors emerged. Four undiscovered superconductors were found among the intermetallic compounds containing cobalt, manganese and iron.

STUDIES OF FINE PARTICLES

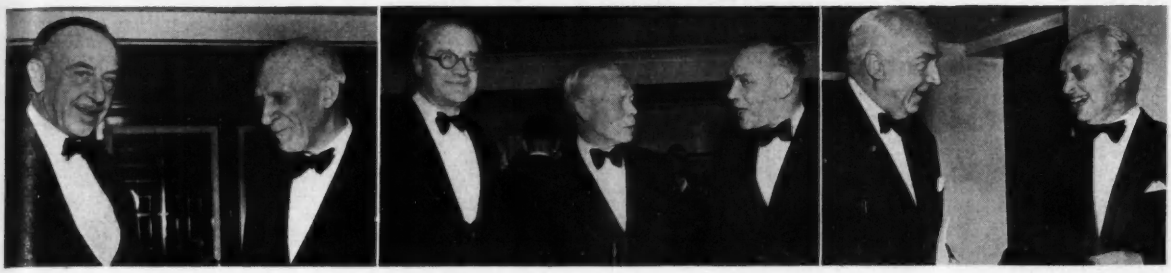
INVESTIGATION of fine powders, aerosols and colloidal suspensions by the electron microscope involves a number of difficulties. If the specimen is simply deposited on an aperture a relatively thick layer is obtained, showing only the general, external conformation of aggregates, on the other hand the usual replication techniques lead to distortion and possibly rupture of the replicas during the process of preparation. A technique recently described in the Russian 'Journal of Physical Chemistry' (V. I. Lygin and Chen Ven-Khan, *Zhur. Fiz. Khim.*, 1958, *32*, 465) for preparing carbon replicas of such objects, is simple in execution and is free from any possibility of rupture or distortion. It is claimed that the resolution obtainable by this method is about 50Å.

A sample of the particles to be examined, if not already in suspension in a liquid, is dispersed in a suitable liquid by trituration or ultrasonic agitation, and then dried out on a fused quartz slide. Smokes are deposited directly on to the slide. Fused quartz was chosen as substrate because experiment showed that the majority of such slides showed no measurable structure and the surface irregularities of the remainder were sufficiently characteristic to be easily distinguishable from the type of specimen in question. The slide with its deposit of particles is then carbon-coated in the usual bell-jar vacuum apparatus at a pressure of 10^{-3} to 10^{-4} mm. Hg, using spectrographically pure carbon electrodes with a distance of 10 cm. between the discharge and the object. The thickness of the carbon layer used, was about 100Å.

For preventing deformation of the replica during the process of removal it is reinforced by dipping into a drop of molten paraffin wax. After the wax is set the cast so obtained is immersed in hydrofluoric acid until the quartz and sample are completely dissolved away. The washed replica is then shadowed with platinum or chromium, again in the normal bell-jar apparatus, and then transferred to a specimen grid. After dissolving the wax in toluene the shadowed replica is ready for examination in the electron microscope.

Resolution obtainable by this method was illustrated by a comparison of micrographs of particles of magnesium oxide smoke obtained by using the technique described and by simple photographing on an apperture. The authors claim that the clear indication of faces and angles of crystals given by this method makes it possible to follow micro-chemical reactions taking place on a quartz slide by crystal analysis of the products. They also stress the value of stereophotography in conjunction with their carbon replica technique, and illustrate this with stereomicrographs of diatoms and of a dried out silica gel.

ABCM DINNER HIGHLIGHTS FTA



At the chairman's reception, l. to r. G. H. W. Cullinan (Shell Chemical), chairman, exports committee, Sir Robert Robinson (Shell Chemical), president, Society of Chemical Industry; Eric Stein, Sir Graham Hayman and A. F. McDonald, from the Distillers Co. Ltd.; Sir Miles Thomas (Monsanto Chemicals) and Bernard Hickson (Hickson and Welch), ABCM chairman

ABCM Formula for Definition of Origin of Raw Materials . . .

THE scheme put forward by the ABCM for the definition of origin by process criteria was referred to by Mr. Bernard Hickson, chairman, at the annual dinner held at Grosvenor House, London W1 on 8 October. Mr. Hickson was proposing the toast of 'The guests' to which Lord Mancroft, Minister without Portfolio, responded. There were more than 1,200 members and guests present.

Mr. Hickson said it was not thought possible on the Continent that a formula could be prepared which would be workable by the customs authorities of the free trade area countries without leaving a loophole for the entry of a flood of cheap chemicals from outside to which little processing and increased value had been added inside the free trade area.

A special panel of experts had devoted weeks to detailed work on this point. As a result, a scheme had been approved by ABCM and accepted by the Board of Trade and the Customs Departments. This now formed the basis for negotiation within the Organisation for European Economic Cooperation in Paris. ABCM officials had discussed this plan for dealing with origin of goods with the directors of the other chemical manufacturers' associations in West Europe.

Mr. Hickson declared: 'We are proud to be in a position to say that the detailed scheme for chemicals is considered acceptable and workable by the British Government Department concerned and thus Mr. Maudling and other British Government negotiators now have a positive scheme in their hands.

'Unofficially, we know that the chemical manufacturers' associations of the Scandinavian countries, Austria and Switzerland approve this plan. In addition, with the exception of France, it has been received with sympathy and understanding by the chemical manufacturers' associations in the other countries of the Common Market'.

In recent talks with presidents of European chemical associations, Mr. Hickson said that the strongest views had been expressed by them all on the necessity for West European integration, while fully recognising the differences in detail between the UK and French attitudes.

'With the success of the new French Government and their new constitution, I hope that the OEEC negotiations will be resumed with determination on all sides to reach a scheme satisfactory to all our countries in this vital first stage of closer integration in Europe'.

Mr. Hickson paid tribute to the work of Mr. W. A. M. Edwards, chairman, and the members of the ABCM free trade area committee for all their work on this matter.

He then referred to the association's scheme to help members in organising basic research in chemical engineering, stating that the co-operation and advice of the departments of chemical engineering had been enlisted in nine universities. This scheme would apply to many of the basic common problems that were better handled by a co-operative effort. The work would be financed from the common funds of the association and so reduce to a minimum the special appeals to members for financial support.

An ABCM committee now had long term work under discussion with a group of university professors and it was hoped that this would result in useful information for the chemical industry. By-products of the scheme would undoubtedly be closer consultation between the universities and industry on educational planning and the valuable experience on planned research which

. . . Devised by FTA Committee

INTENSIVE work on the part of the Association of British Chemical Manufacturers has led to the devising of a formula to overcome difficulties of definition of origin of chemicals that have in part delayed progress in negotiations for the proposed free trade area. The object of ABCM's work was to meet the views held on the one hand by the Six and on the other by countries such as Sweden and Switzerland.

Although earlier such a scheme was not thought possible on the Continent, an ABCM sub-committee of experts has produced proposals which are considered workable by the UK Government Department concerned. The ABCM scheme is based on detailed process criteria, the object being to express in the form of process criteria the equivalent at least of 50 per cent area added value, and to ensure that sufficient processing and work are carried out in the area for the resulting products to be considered of FTA origin.

So far the panel has concentrated on organic chemicals; it is now devising process criteria for other sections of the industry, including dyestuffs, plastics, fertilisers, tar products, etc. The ABCM free trade area committee is headed by Mr. W. A. M. Edwards, purchasing controller of Imperial Chemical Industries Ltd., and comprises 20 representatives of ABCM-member firms covering the interests of both large and small manufacturing companies. The detailed work on the proposals has been carried out by a four-man sub-committee, with Mr. N. E. Wallace (ICI) as chairman.

The scheme is being discussed in detail in Paris at meetings of the Chemical Experts Working Party of the Organisation for European Economic Co-operation, of which Mr. Herbert W. Vallender is chairman.

Left to right, top row, Sir Alexander Todd, chairman, Advisory Council on Scientific Policy, with Sir Clavering Fison (Fisons Ltd.); Sir Norman Kipping, director-general, FBI, Sir Cyril Musgrave, Permanent Secretary, Ministry of Supply, Lord Mancroft; bottom row: Sir William Garrett (Monsanto Chemicals), ABCM vice-chairman, D. J. Bird (Fisons Ltd.), Sir Alexander Fleck (ICI), president, British Association; F. G. Pentecost (A. Boake, Roberts and Co.) and Bernard Hickson, ABCM chairman

the young graduates who were engaged on this work would gain.

Principal guest at the dinner was Lord Mancroft. Among other prominent guests were: Dr. J. S. Carter, Chief Alkali Inspector; Sir James Crombie, Secretary, HM Customs and Excise; Mr. W. A. Damon, former Chief Alkali Inspector; Professor H. J. Emeléus, president, Chemical Society; Captain N. Fawcett, Chief Inspector of Explosives; Sir Harry Jephcott, chairman, DSIR, Council for Scientific and Industrial Research; Sir Norman Kipping, director-general, Federation of British Industries; Mr. T. W. McCullough, Chief Inspector of Factories; Sir Harry Melville, secretary, DSIR; Sir Cyril Musgrave, Permanent Secretary, Ministry of Supply; Vice-Admiral Sir Charles Norris, director, British Productivity Council; Sir William Palmer, chairman, Dyestuffs Advisory Committee, Board of Trade; Sir Leslie Robinson, Second Secretary, Board of Trade; Sir Robert Robinson, president, Society of Chemical Industry; and Sir Owen Wansbrough-Jones, chief scientist, Ministry of Supply.

No Major Change in ABCM Officers For Coming Year

THERE are no changes in the principal officers of the Association of British Chemical Manufacturers for the year 1958-1959. The chairmanship of a number of ABCM committees, however, changed hands during the year as follows: Mr. G. H. Carnall (Clayton Aniline Co. Ltd.) succeeded Mr. Harry Jackson as chairman of the Dyestuffs Committee; Mr. H. M. Peacock (Tate and Lyle Ltd.) succeeded Mr. R. V. Bradshaw (May and Baker) as chairman, London Area Fuel Efficiency Committee; Mr. N. F. Patterson (Monsanto Chemicals Ltd.) succeeded Sir William Garrett (Monsanto) as chairman, British Chemical Industry Safety Council.

The council for 1958-59 will be as follows:

President: Sir Walter Worboys (ICI); *vice-presidents*: Dr. F. H. Carr, C.B.E., Sir Roger Duncalfe, Dr. E. V. Evans, O.B.E., Sir Grayham Hayman (The Distillers Co.), Sir Harry Jephcott (Glaxo Laboratories), C. F. Merriam, M.C., L. P. O'Brien (Laporte Chemicals), G. F. Williams (British Drug Houses).

Elected members: *Chairman*: B. Hickson (Hickson and Welch); *vice-chairman*: Sir William Garrett, M.B.E. (Monsanto Chemicals); *hon. treasurer*: J. L. Harvey, M.B.E., D.L. (The Fuller's Earth Union).

G. H. Beeby (British Titan Products), D. J. Bird (Fisons), I. V. L. Fergusson (Evans Medical Supplies), J. C. Hanbury (Allen and Hanburys), R. S. Haskew, O.B.E. (The General Chemical and Pharmaceutical Co.), Dr. W. G. Hiscock (Imperial Smelting Corporation), L. G. Matthews (Burroughs, Wellcome), F. S. Poole (Peter Spence and Sons), H. V. Potter (Bakelite), E. Stein (The Distillers Co.), Dr. J. E. Taylor (Joseph Crosfield and Sons), R. C. Todhunter (ICI), B. White (A. Boake, Roberts and Co.).

Co-opted members: E. L. Bush (W. J. Bush and Co.), G. H. W. Cullinan (Shell Chemical), M. J. C. Hutton-Wilson (Associated Chemical Companies), J. H. Townsend (ICI).

Hon. vice-presidents: C. E. Carey (South Eastern Gas Board), Lord McGowan, K.B.E. (ICI), K. H. Wilson, O.B.E.

Director: George Brearley; *general secretary*: A. J. Holden.

New Chemical Engineering Section at Leeds University

THE major part of a £2 million extension to the University of Leeds has been completed with the opening this month of a new building for the Houldsworth School of Applied Science, in which the department of chemical engineering, with probably the finest laboratory of its kind in the UK, is now housed.

The first appointment to the Brotherton Chair in Chemical Engineering is expected shortly.

The main block of the new building is a steel-framed structure faced with Portland stone fronting on Reservoir Street, and the total floor area is about four times that previously available for the three departments of the school.

Accommodation for the department of chemical engineering is in two sections. On the second floor of the main building there is a large process instrumentation laboratory, research and staff rooms, a lecture theatre seating 200 equipped for sound film projection, small lecture rooms seating 30 and 60, the library and staff common room.

Behind the main building is a large 'workshop' area in which is housed the Charles Brotherton Chemical Engineering Laboratory, 48 ft. high with operating floors at five levels giving a total available floor space of over 12,000 ft.

Here is being assembled semi-scale and pilot plant equipment for teaching and research into unit operations of the chemical industry unlikely to be equalled by any other UK university. A water cooling plant to handle 5,000 g.p.h. has been installed.

This laboratory is named after the late Dr. C. F. R. Brotherton who in 1945 gave £55,000 towards the development of the department.

Courses of three years for a general degree and four years for honours are provided for, but in each case the first two years are spent by the student in acquiring a comprehensive grounding in pure science and engineering. There follows a one or two years' specialising course in chemical engineering when the problems of the industry and the principles of conducting plant processes on a comparatively large scale are studied.

Permission for BNS' Havant Nylon Plant Refused

Portsmouth's three Members of Parliament who approached the Prime Minister to ask him to reconsider a decision to refuse permission to British Nylon Spinners to build a nylon plant at Havant, near Portsmouth, were told that while unemployment in the Portsmouth area was above the national average, the area was well placed to attract concerns from London and the Home Counties, where space is scarce. The Government's policy, it was stated, was to ensure that wherever possible, new factory building should take place where there was most need for it.

NEW ACT WILL GIVE CHEMICAL INDUSTRY SIMILAR PROTECTION

ABCM to Widen Public Relations Service

PROTECTION granted to the UK chemical industry under the new Import Duties Act, 1958, which from 1 January next will transpose the existing UK Tariff into the Brussels Nomenclature form and incorporate the Key Industries Duties, is no less favourable than the protection enjoyed during the lifetime of the Safeguarding of Industries Act. This was stated by Mr. Bernard Hickson (Hickson and Welch Ltd.), chairman of the Association of British Chemical Manufacturers, when he introduced the council's report for the year ending 30 June at the annual meeting last week.

During the year, he said that two major changes in policy introduced for trial periods when the president, Sir Walter Worboys, was chairman, had been ratified. The regional organisations had proved a great success and in future the regional chairman would be given full voting status as members of ABCM council. The chemical engineering research committee, working in conjunction with the British Chemical Plant Manufacturers' Association, had made a start with the programme of co-operative research in chemical engineering.

In considering how the first of a number of joint research projects should be financed, an overwhelming majority of the council decided that new activities of this kind, when in the interests of most members, should in future be financed direct from ABCM funds instead of by a constant series of appeals to individual members. As a result, the cost would be spread on a fair basis through the annual subscriptions which were based on capital employed. Over the years this would cost members collectively no more than the subscription plus special appeals method of financing.

Public Relations Work

The public relations committee would, declared Mr. Hickson, shortly recommend to council a scheme for widening the association's public relations in a general sense and 'putting over' the importance of the British chemical industry to the public, Government departments and the trade unions. With the possibility of the free trade area, the council considered it essential to make known in other countries, as well as in Britain, the vitality of the UK chemical industry.

The report said that the FTA committee had held nine meetings during the year under the chairmanship of Mr. W. A. M. Edwards (Imperial Chemical Industries Ltd.). In view of the large mass of technical data involved in the definition of origin of raw materials, a small subcommittee was entrusted with the task of defining in process criteria form the rules of origin for organic chemicals of chapter 29 of the Brussels Nomenclature. This work had been completed and further work was now in hand on dyestuffs, pharmaceuticals and plastics. ABCM was also collaborating with the Board of Trade and other associations in the drafting of process criteria for other sections of the chemical industry.

Highlights of ABCM Report

- **Public relations to be widened to put across UK chemical industry's vitality.**
- **Individual approach on KID-listing of some polymers.**
- **Vital that mixtures of KID chemicals should be KID-listed**
- **Appeal for funds on Food Testing Research Association was disappointing.**
- **Six chemical engineering research projects to cost £30,000.**

The result of the committee's studies on origin of raw materials had been discussed informally with West European chemical associations in preparation for the detailed negotiation of process criteria in the OEEC Chemical Experts Working Party, chairman of which is Mr. H. Vallender, of the ABCM. The OEEC Working Party had met four times and had accepted a number of the UK proposals for chapter 29 which had been based on the work of the ABCM free trade area committee. The working party will shortly consider dyestuffs and plastics.

Effect of a free trade area on members who were not actively engaged in export overseas trade had been considered by the exports committee. An approach was now being made to the regional committees for their views and a questionnaire was being prepared for circulation to all ABCM members.

Despite detailed and prolonged negotiations the KID and tariff committee was not able to obtain recognition of the justice of its views on the application of the Safeguarding of Industries Act to materials which are held by the Board of Trade not to fall within its scope. As a result, and after taking Counsel's opinion, the committee recommended that in the case of certain thermoplastic polymers, an appeal should be lodged against their non-inclusion in the KID list. In view of the few members involved it was suggested that the case be fought by the individual manufacturers of those materials.

With regard to mixtures of KID chemicals, however prepared, it was agreed that their inclusion on the KID list was of vital importance to the future development of the synthetic organic chemical industry. It was decided to ask the Board of Trade to list such mixtures; if rejected the case is to be taken to the Referee. In view of the broad implications it was felt that this case should be fought by the association. The council accepted this recommendation and agreed to provide financial assistance.

The appeal for financial support for the setting up of a Food Testing Research Association had been disappointing. Only about two-thirds of the £10,000 allocated as the share of ABCM and its affiliated associations was promised from member firms. The question is still under discussion by the council.

Of the chemical engineering research and advisory service, it was stated that the report of the distillation panel had been accepted with the recommendation that the six research projects detailed in the report should be sponsored at an estimated cost of £10,000 a year for three years. Of this the British Chemical Plant Manufacturers' Association undertook to provide 20 per cent. Nine of the university schools of chemical engineering are collaborating in carrying out the work. A panel of specialists in filtration would start a study of that subject this autumn.

Permitted Food Colours

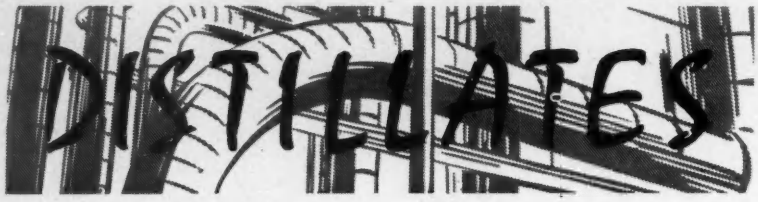
The dyestuffs committee reported that considerable progress had been made by the British Standards Institution committee concerned with the preparation of standard specifications and methods of analysis for permitted food colours. Some specifications were nearing completion.

Referring to safety in the chemical industry, the report stated that the arrangement of accident and lost time returns in a series of 'league tables' according to numbers of employees had brought to light some interesting facts. A good safety record was clearly shown not to be the prerogative of the larger companies, while comparison of their own results with others in the same category had led many companies to re-examine their safety organisation.

The technical committee had continued its revision of the tests for toxic gases in industry. The new method for hydrogen cyanide using Prussian blue papers had been tried under works conditions with good results. The test for lead fume in air had been further developed and said to be promising. A test for toluene based on a modification of the benzene test had been devised but required further development.

A search was being made for new methods for testing phosgene, both to increase the sensitivity and to overcome the difficulty of incomplete absorption

(Continued in page 644)



★ A REPORT to be published by the OEEC Chemical Products Committee later this year will show that the European chemical industry last year expanded at double the rate of industry in general.

The committee, chairman of which is Mr. de Schrijver of Belgium, has sent me some advance details of the report which will show that after a slightly lower rate of expansion in 1956, chemical production in OEEC-member countries increased by 10 per cent last year, while total industrial production rose by 5 per cent. For the whole of 1958, chemical production is again expected to increase, but most probably more slowly than last year.

For instance, production of chemicals in the first six months of 1958 was 6 per cent greater than in the first six months of 1957, the corresponding figure for total industrial production being 3 per cent. As in recent years, the sectors expanding most rapidly are petrochemicals, plastics and nitrogenous fertilisers.

Investment in the European chemical industry in 1957 is estimated to have been $1,000 million, some 7 per cent above the 1956 figure. Trade in chemical products is still growing rapidly, particularly exports to non-member countries.

★ A NEW and formidable protagonist to enter the lists on behalf of the practice of fluorinating domestic water supplies is Dr. Magnus Pyke, director of the Glenochil Research Station, Menstray, of the Distillers Co. Ltd. Dr. Pyke, who is chairman of the Scottish section, Society for Analytical Chemistry, is well known as an author and broadcaster.

He recently told members of the Forth Valley Chamber of Commerce that incontrovertible evidence existed to show that drinking water lacking fluorine resulted in bad teeth for members of the community who drank that water.

Dr. Pyke spoke of the barrier of prejudice and unreason against 'horrible chemicals' which had forced some wise authorities whose water supplies had been treated with fluorine to discontinue that practice. As Dr. Pyke rightly says it is the old story of well-publicised ignorance triumphing over science. Many a good cause has been lost because its opponents thundered more loudly in the correspondence columns of *The Times*.

★ APART from the most praiseworthy initiative taken by ABCM in the free trade area negotiations (see pp. 629 and 631), I was particularly interested in the chairman's remarks on another subject at the annual meeting. The association's public relations committee has for some time been considering the possibility of widening ABCM public relations in a general sense and to 'put over' the importance of the UK chemical industry to the public, Government departments and the trade unions.

The committee is now on the point of making a recommendation along these lines to the association's council. I have no doubt that it will include the proposal that the association should appoint a public relations officer.

I have often said that the British chemical industry lacked an appreciation of the value of publicity. Now it seems that this serious shortcoming is about to be made good. My advice to ABCM for what it is worth is that they should appoint someone with first hand knowledge of the Press. There are too many cases in industry of public relations officers who, with no experience of the work involved, see their job as one of preventing the publication of anything concerning their company, rather than run the occasional risk of having something published that ought not to have been. That negative approach to public relations is much more widespread than most of my readers would imagine.

★ MAJOR supplier to the world outside North America and Russia of 'Octel' anti-knock compound containing tetraethyl lead (TEL), the Associated Ethyl Co. Ltd. showed members of the technical Press their new chlorine plant at Ellesmere Port (see p. 635). The company, in which certain oil companies have major holdings, produces 'Octel' solely for the oil industry. It exports 83 per cent of its production and thus provides 5 per cent of the UK's total chemical exports.

Associated Ethyl have become increasingly self-reliant in the manufacture of their intermediate chemical requirements. With the new chlorine plant now producing liquid chlorine, the principal purchased raw materials are reduced to lead, ethane, ethylene and salt, of which the company remains a major consumer.

The new brine electrolysis plant consumes as much electricity as the city of Chester. Converting the current from a.c. to d.c. is accomplished with the aid of the largest germanium rectifier installation of its type at present in Europe and possibly the world.

In constructing the two-storey building housing the cells, very great care had to be taken to ensure that the whole structure was level and was not liable to differential settlement. The cells are installed on the first floor of the building and the associated pipework is suspended under this floor. Floors and drainage systems have been constructed so that losses due to possible spillage of mercury are minimised by installing mercury traps. At the present time, it is too early for the company to know the amount of mercury lost, but having regard to BASF's experience who have licensed the cell design and know-how to Associated Ethyl, not more than a 3 per cent per annum loss seems likely.

While the company can consume all the chlorine it produces, arrangements for disposal of the by-products of the brine electrolysis—high-purity caustic soda and hydrogen—have been necessary. The caustic liquor is being sold to an oil company to be used in refining processes, and plans are under way to pipe the hydrogen to a manufacturer of edible fats and oils seven miles away along the Manchester Ship Canal.

★ THE NEW ISR synthetic rubber plant at Hythe will be capable of meeting 27 per cent of the total UK demand for all types of rubber, including natural. With a capacity of 70,000 tons a year, it will be able to cater for all UK needs for SBR (styrene-butadiene rubber), particularly when it is remembered that annual UK consumption of all types of synthetic rubber is 65,000 tons. The dollar saving to the UK as a result of the start up of this, the first British plant for the bulk production of general purpose synthetic rubber, could be about $25 million a year.

I was interested to see last week that there is plenty of room for expanding this new plant. I also noticed that one of ISR's two neighbours, Monsanto, appear to have almost completed their new polythene plant. The other neighbour, Union Carbide, had started site work in preparation for their new ethylene oxide plant.

While touring the ISR plant I saw a new pipeline being added to the existing 50 miles or more of pipes. When completed it will provide a pneumatic delivery service to the control laboratories. At present the analytical chemists spend much of their time cycling round the works collecting samples for testing. Now his novel idea will save them much time and energy in future.

★ THE US Navy has been conducting experiments in rain-making using carbon-black for cloud seeding. By dropping carbon-black into the atmosphere from a plane, Navy Weather Service chemist, Florence W. van Straten, made clouds evaporate.

The theory proposed for these findings is that absorption of the sun's heat by carbon black particles upsets the temperature balance and may cause water droplets to form or evaporate. Theoretical aspects of the process are now being checked by a series of studies in cloud physics.

In previous cloud experiments expensive dry ice and silver iodide have been used on very low-temperature clouds. Use of carbon black for cloud formation is not only cheaper, but it appears that results are possible with clouds at any temperature.

Alembic

NEW LIQUID CHLORINE PLANT

Associated Ethyl Increase UK Capacity by 5%

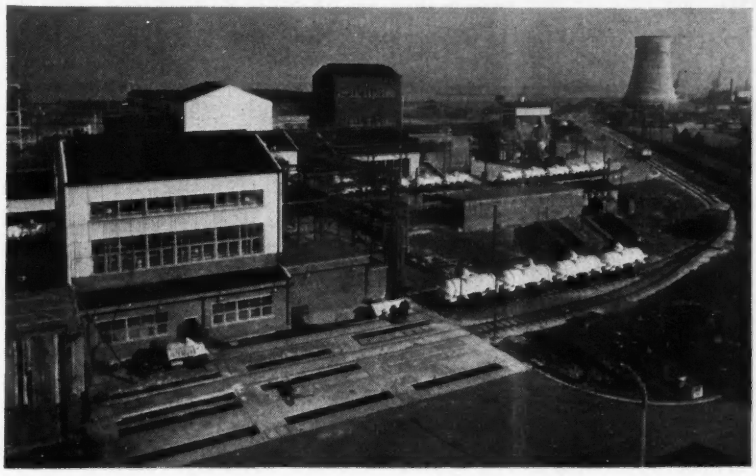
WITH the start up of their new factory for brine electrolysis at Ellesmere Port, The Associated Ethyl Co. Ltd. have increased the installed chlorine manufacturing capacity of the UK* by about 5 per cent. The company requires large quantities of chlorine in the production of their antiknock compounds ('Octel') which contain tetraethyl lead.

The Ellesmere Port factory, which was commissioned in 1953-54, has provided additional manufacturing capacity for tetraethyl lead. It also includes plants for producing metallic sodium (Downs Cells) ethyl chloride and ethylene dichloride.

While the electrolysis of fused sodium chloride in Downs Cells provides a theoretical equivalent quantity of chlorine for the manufacture of ethyl chloride, additional chlorine is required to make up process losses, to make ethylene dichloride, and also to extract bromine from seawater at Associated Ethyl's Hayle, Cornwall, and Amlwch, Anglesey, plants.

It was originally intended that the additional chlorine required, which amounted to a substantial quantity (between 20,000 and 40,000 tons a year), would be purchased from outside sources. However, it became apparent, Associated Ethyl state, that the required quantity might not be available after the end of 1957 The company therefore decided to install their own plant, taking into account the fact that the capacity should be adequate for the increasing demand of chlorine during a period subsequent to the commissioning. The decision to produce the chlorine by the conventional process of brine electrolysis has resulted in the availability of considerable quantities of by-product caustic soda and hydrogen.

* *Estimated at between 460,000 and 500,000 tons a year.*



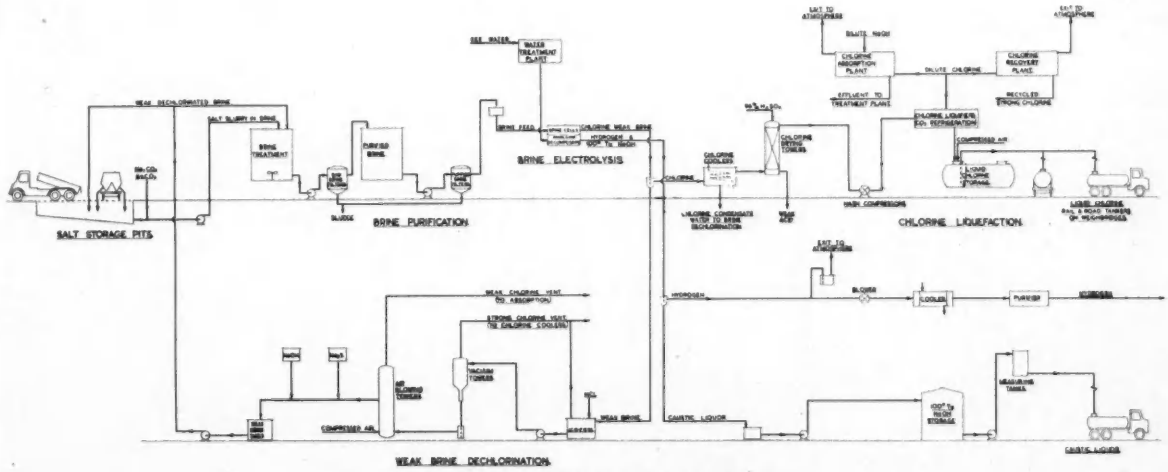
A view of the site of the new liquid chlorine plant

Considerations as to choice of site for this chlorine plant were the availability of salt and electrical power and the distribution of the by-products of brine electrolysis. The Ellesmere Port site fulfills these criteria; it is linked to the company's existing Ellesmere Port factory by a strip of land adjacent to the Manchester Ship Canal; and its extent (some 30 acres) will permit further expansion. Electric power from the local Area Board is used. Conversion from a.c. to d.c. has resulted in the choice of germanium rectifiers. The installation is understood to be the largest industrial application of germanium rectifiers of this type operating in Europe and possibly the world. Choice of the germanium rectifiers is due to their particular advantage in obtaining high conversion efficiencies at comparatively low voltages.

Emergency electrical power supplies (based on a diesel generator) can automatically restore the supply of a.c. current to important items of equipment such as mercury pumps, chlorine fans and certain brine pumps.

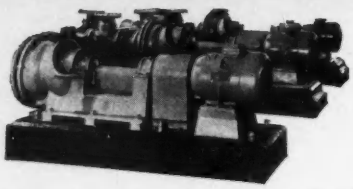
Choice of mercury cells as designed and operated by Badische Anilin-und Soda-Fabrik A.G., Ludwigshafen, Germany, was made, after available processes operated in the world were reviewed. A feature of the BASF cells is the rubber lining of the bottom of the cell. The BASF process of brine purification, dechlorination and resaturation was also adopted. Process design, which was started towards the end of 1954, was carried out within the Associated Ethyl company; civil engineering design was done by L. G. Mouchel's, civil engineering consultants; mechanical, electrical and instrument engineering design was carried out partly within the company and partly by Matthew Hall and Co.

Design of the chlorine liquefaction equipment follows a similar general pattern

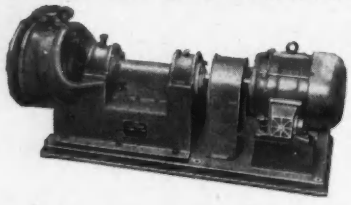


Simplified flow-sheet of new chlorine plant

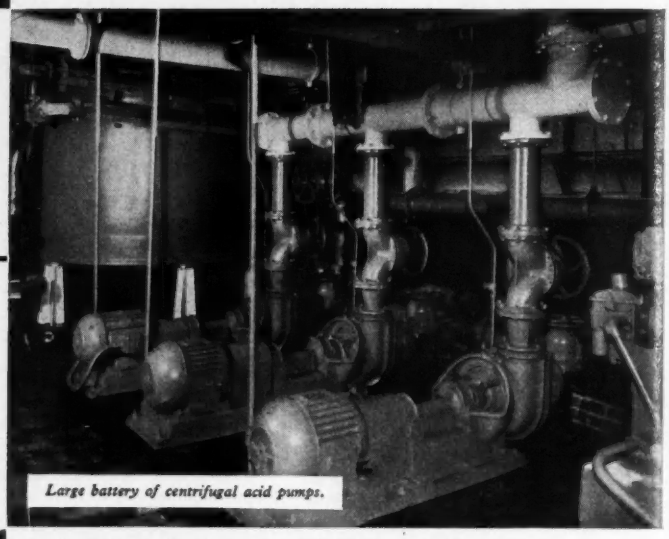
let MITCHELL handle YOUR acid pumping problems



Battery of Mitchell centrifugal pumps installed in a large chemical works.



Close-up view of a Mitchell horizontal centrifugal pump direct motor driven.



Large battery of centrifugal acid pumps.

Portable rotary displacement pump pumping plating solutions in the motor car trade.

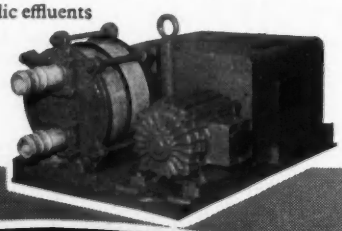
Mitchell centrifugal pumps handling sulphuric acid in a large chemical plant.

Mitchell centrifugal pumps are installed on the Hydrochloric Acid Storage section of the New Chlorine Plant at The Associated Ethyl Co. Ltd., Ellesmere Port.

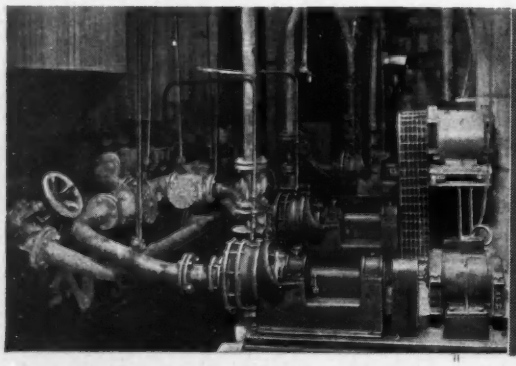
MITCHELL PUMPS ARE EXTENSIVELY USED IN INDUSTRY FOR PUMPING:—

- Zinc Leach for batch and continuous galvanising processes.
- Sulphuric Acid and contaminated wash waters on pickling tanks and continuous pickling plants.
- Chromic Acid and Nickel Solutions for electrolytic plating plants including pumping to filters, etc.
- Waste pickle liquor and acidic effluents for neutralisation prior to disposal.

Hand operated portable diaphragm pump for emptying carboys or tanks and for general duties.



Close-up view of a diaphragm pump similar to the hand operated unit but arranged for motor drive.



THE MITCHELL ORGANISATION

Specialists in Acid Pumps

THE ACID PUMP DIVISION

L. A. MITCHELL LIMITED

HARVESTER HOUSE, 37 PETER ST., MANCHESTER 2 TEL. BLA 7224/7 AND 7824/7

LONDON OFFICE: PORTLAND HOUSE, 73 BASINGHALL ST., LONDON E.C.2. TEL. MET 8321/2

1318

to the existing plant for liquefaction of Downs Cell chlorine, in that chlorine drying is by sulphuric acid circulation through towers, compression is by five Nash compressors working at 30 p.s.i. and liquefaction is accomplished by two-stage refrigeration from a CO_2 system.

An important feature of the plant is that it is designed to produce liquid chlorine, and does not provide any flexibility in the distribution of chlorine gas for the manufacture of chlorine derivatives. A chlorine recovery process developed by the Diamond Alkali Co., US, has been installed to utilise dilute chlorine gas, which passes unliquefied through the liquefaction system, and also vent gases resulting from air-pressure transfers of liquid chlorine.

As the entire process of electrolysis and chlorine liquefaction is operated continuously, and depends on a sequence of interconnected process sections, 'stand-by' spare equipment has been installed.

The BASF mercury cell consists of a rubber-lined trough (overall depth 5 in.) containing a thin layer of mercury which forms the cathode. Graphite anodes, which are horizontal plates, are suspended from the cell cover by vertical graphite stubs which protrude through the cover. The brine cell is sloped such that the mercury amalgam continuously traverses the length and then, via a separating weir, enters a 'decomposer' where it reacts with water to form caustic soda and hydrogen. The mercury is then recirculated from the 'decomposer' discharge by pump to the brine cells. BASF have had their cells in operation for many years without many repairs being required.

Purified water, provided by a water-treatment plant, is of importance both for the operation of the decomposer, and also for the purity of the caustic liquor.

Mercury Cells Provide High Purity NaOH

A feature of these mercury cells, it is stated, is that they provide the highest grade of commercial caustic liquor without further process treatment (cf. diaphragm type cells). 100°TW caustic liquor (47.7 per cent NaOH) is produced. To avoid contamination of the caustic liquor, the four caustic liquor storage tanks are rubber lined. Caustic liquor transport tankers are filled from these tanks via measuring tanks.

The hydrogen produced from the decomposer is also of high quality. It is intended that part of this hydrogen will be burnt to produce nitrogen which will be piped to Associated Ethyl's adjacent factory. Plans are under way to sell the remainder for hydrogentation of fats, etc., to a manufacturer of edible fats and oils seven miles away along the Manchester Ship Canal.

Weak brine from electrolysis is made up to strength with added vacuum salt, delivered to the plant from two external sources, in both road and rail vehicles. These vehicles discharge into three lined (plastics lining faced with tiles) storage pits.

All equipment in contact with brine is constructed in anticorrosive materials which will not contaminate the brine with traces of elements, notably V, Cr and Mo, which are known to cause decomposition of sodium amalgam. Much of the equipment is rubber lined. Brine handling equipment is lagged to minimise heat losses (temperature of the brine is maintained at 70°C) and an approximate heat balance is achieved.

Pure concentrated brine (315 g per litre) is fed to the electrolysis cells leaving these at a lower concentration (270 g. per litre) and slightly acid due to dissolved chlorine. The chlorine is removed from the brine by (*a*) acidification, (*b*) vacuum, and (*c*) air blowing. Remaining traces of chlorine are removed by treatment with sodium sulphide solution.

A third part of the dechlorination brine stream is fed into one of the salt storage pits and serves to carry a slurry of salt into the brine preparation tanks where this slurry is agitated with the remainder of the brine to resaturate the solution. Caustic soda, sodium carbonate and barium carbonate are also added to remove magnesium, calcium and sulphate. As the main brine impurity is sulphate, the sludge from brine purification consists chiefly of barium sulphate, for which a use may subsequently be found.

Self-balancing Brine System

The resulting precipitates are removed by filtration through two Kelly pressure filters in series, with provision for intermediate storage. Most of the water leaving the electrolysis cells with the chlorine gas is condensed and returned to the brine circulation. The brine system is reported to be approximately self-balancing for water requirements as the salt received contains about 2 per cent moisture.

Chlorine leaving the cells contains carbon dioxide and hydrogen as minor impurities; discharge of hydrogen with the chlorine is minimised as far as possible by the cell design and process control; the chlorine is also saturated with water vapour, the greater part of which is removed by cooling with water. After cooling the chlorine passes through three towers in series through which sulphuric acid is circulated. The chlorine is thus rendered sufficiently dry to be subsequently handled in mild steel equipment without serious corrosion.

Five Nash compressors sealed with sulphuric acid compress the chlorine and deliver it to two liquefiers in series (95 per cent of the chlorine is liquefied). Liquid chlorine drains via sealing lutes to storage tanks of 50-ton capacity, and 'tail gas' containing some unliquefied chlorine and also incondensable gases originally present in the chlorine passes through a pressure control valve to an absorption system.

The cell room

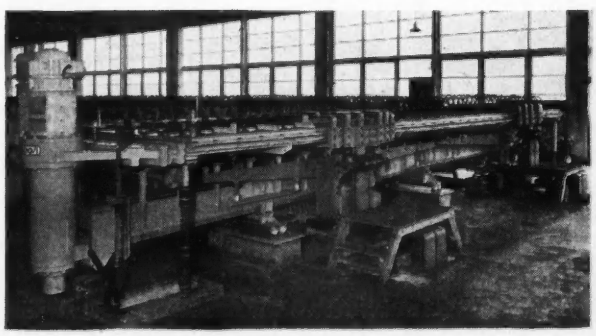
Analytical control tests and recording katharometers are used to check the hydrogen content in the inlet and 'tail gas' of the liquefiers. In order to ensure that the explosive range is avoided by an adequate safety margin, air may be added to the chlorine gas stream.

The chlorine storage tanks are mounted on semi-weigh scales and are all connected via a pressure release vessel. This has been so designed to avoid any risks of hydraulic pressures on the storage tanks, which might possibly arise if they were, by mal operation, completely filled with cold liquid chlorine and subsequently allowed to increase in temperature. From these storage tanks the liquid chlorine is transferred to road or rail tankers by a pressure of dry air. Provision has been made for the possible installation of liquid chlorine pumps at a later date. Imperial Chemical Industries Ltd., General Chemicals Division, provided advice on liquid chlorine storage and transport.

All liquid chlorine vessels are constructed of 'Coltuf' steel to eliminate embrittlement risks which might otherwise be present due to the low temperature of the liquid chlorine. For the liquid chlorine valve gland packings, polytetrafluoroethylene (p.t.f.e.) has been used.

To avoid any discharge of chlorine to atmosphere, towers circulated with dilute caustic liquor absorb all chlorine which cannot be utilised. In normal operation the caustic absorption system is only required for the small quantity of highly diluted chlorine present in the air from the air blowing section of the brine dechlorination plant. The towers have, however, been so designed that the total chlorine produced in the cell room can be absorbed for a short period. Chlorine 'tail gas', and

(*Continued in page 639*)



Detail of a cell. Brine enters by rubber/glass piping (left). Graphite anodes can be seen on top of the shallow trough

TYPICAL ANALYTICAL DATA

Purified Brine to Cells		Caustic Liquor (%)		Chlorine Gas ex-cells Vol. % (dry basis)		Hydrogen Vol.% (dry basis)	
NaCl	315 g.p.l.	NaOH(100°Tw)	46.7%	Cl_2	98.7	H_2	Min. 99.9
SO_4	1.6 to 1.8 g.p.l.	Na_2CO_3	0.03%	H_2	0.4	O_2	Max. 0.02
NaOH	0.02 g.p.l.	Na_2SO_4	0.01%	CO_2	0.8	N_2	Max. 0.05
Na_2CO_3	0.2 g.p.l.	NaCl	0.015 to 0.025%	CO, O_2, N_2	0.1	CO_2	Max. 0.05
$NaClO_3$	0.1 to 0.5 g.p.l.						
Ca	1.0 to 3.0 mg/litre						
Mg	1.0 mg/litre						

vent gases from transfers, can also be absorbed in the towers, although normally these gases will be fed to the chlorine recovery plant and the total chlorine content subsequently re-fed to the main liquefiers. The chlorine recovery plant includes an absorbing and stripping column. It is designed to receive weak chlorine both from the mercury cell factory and also by interconnecting pipeline from the adjacent factory where Downs cell chlorine is liquefied. The recovery plant which will not be in operation until later this year, is believed to be the first of its kind in Europe.

Electrochemical Data

Amperage per cell	30,000 amperes.
Cathodic current density	2,580 amps. per square metre.
Voltage	3.9 to 4.2 volts (depending on lifetime and state of anodes).
Current efficiency (base on NaOH produced)	96%
Power usage ...	330 K.W.H. D.C. per 100 kg. gaseous chlorine.
NaCl usage ...	177.5 kg. NaCl per 100 kg. gaseous chlorine.

Particular attention has been paid to safety aspects in the plant. In addition to the more usual chemical hazards associated with corrosive liquids such as sulphuric acid, caustic soda, hydrochloric acid and sodium sulphide solutions, numerous safeguards have been provided by design and operating methods for the handling of hydrogen, chlorine gas, liquid chlorine and mercury.

Associated Ethyl's experience in the control of the possible hazards of lead by means of a comprehensive system of monitoring and control is in application for mercury. Mercury traps are installed in the floors and drainage systems of the two-storey building housing the cells. The pipework in this block is suspended under the first floor of the building.

Communication systems to assist the safety and smooth operation of the plant have been carefully evolved. In addition to various alarm systems, telephone systems, and 'Clearcall' intercommunications, provision has also been made for immediate interruption of the total electrolysing current to the cells from strategic points in the process (including the liquid chlorine control room and in the control room of the cell hall).

Throughout the plant full use has been made of the latest available types of instruments. Special instruments include pH, Eh, turbidity and density meters for brine, conductivity meters for decomposer feed water, analysis instruments for chlorine strength, hydrogen and moisture content of chlorine, oxygen and mercury in hydrogen. The density of caustic soda liquor and the volumes of caustic liquor discharge from storage tanks are also recorded. Flow-sheet instrument panels are installed at both the cellroom and the liquefaction plant.

Detailed prior precautions resulted in a remarkably trouble-free start-up of the plant. Pre-commissioning tests began on available items of equipment during December, 1957. Prior to the start-up of the cellroom, the liquefaction plant was test operated with chlorine received by pipeline from the existing Downs Cell plant. The brine system was also pre-tested independently. About one-third of the total cells had to be started at one time and at the final stage of commissioning of the cells and brine systems, BASF personnel assisted.

Current (d.c.) was first applied in February this year and with one intermission at the beginning of May the plant has operated continuously.

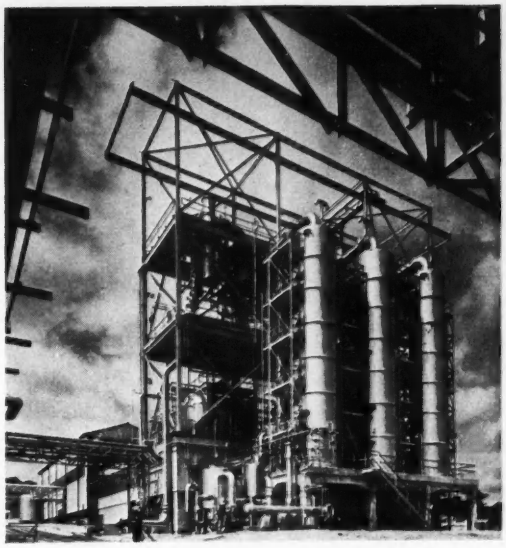
Production is stated to be according to quantity, quality and efficiency expectations and no lost-time accidents have occurred.

Contractors

Main Contractors: George Wimpey and Sons Ltd.—building and civil engineering construction; D. and C. and William Press Ltd.—mechanical plant erection; W. H.

(*Continued on page* 644)

NEW ISR SYNTHETIC RUBBER PLANT MAY SAVE $25 M. A YEAR



The three Italian styrene stripping columns each of which contains 14 plates

THE new £6 million plant of the International Synthetic Rubber Co. Ltd. at Hythe—the first British venture into the bulk production of general purpose synthetic rubber—is now fully commissioned. With a capacity of 70,000 tons a year, the plant produces butadiene/styrene copolymers via a low temperature, 'cold' emulsion polymerisation reaction in the ratio of three parts of butadiene to one of styrene.

The ISR output will make the UK independent of overseas sources of the material and provide a considerable quantity for export. At present imports of this type of rubber cost the UK more than $25 million a year. The plant, on Southampton Water, occupies a 54-acre site. With installations covering 280,000 sq. ft., it was built in 16 months beginning February 1957. Production trials began in March this year. Equity capital of ISR has been subscribed by the UK tyre companies.

Because, it is stated, that the specialised technical resources for the undertaking were not available in the UK, the Blaw-Knox Co., Pittsburg, Pa., were entrusted with the designing, installation and commissioning of the ISR plant. Matthew Hall and Co. Ltd., London, and John Laing Ltd. carried out the civil engineering work. Between 90 and 95 per cent of the plant and equipment was purchased in the UK. Purchases valued at £100,000 were made in the US and £200,000 was spent on the Continent. The styrene stripping columns were purchased in Italy while a number of the largest glass-lined vessels came from the US.

Raw Materials Supplies

Butadiene, annual consumption of which will be about 50,000 tons, is received by pipeline from the nearby Esso Refinery at Fawley, and stored in tanks with capacities of 350,000 Imp. gall. Styrene (annual consumption about 13,000 tons) comes from Shell Chemical, Partington, and Forth Chemicals, Grangemouth, and is stored in tanks with capacities of 350,000 Imp. gall. Both are supplied in liquid form and the first step in the process is to remove the inhibitor—tertiary butyl catechol. In the case of butadiene, this is done by washing with aqueous caustic soda which results in the inhibitor being removed via the aqueous phase as its sodium salt.

The various materials for the polymerisation reaction, including the emulsifier solution which consists of rosin soap or fatty acid soap and other materials that are dissolved in water, are charged together via a cooler to bring them down to the 41°-55°F temperature range. The activator (an aqueous solution of inorganic salts including the reducing agent) is not added until point of entry to the reactors so that the operation of the redox catalyst system cannot start until this point.

The whole polymerisation operation is continuous and the rate is controlled by varying the amount of activator solution and catalyst solution charged. The plasticity or Mooney viscosity of the polymer is controlled by the amount of modifier charged. The polymerisation is stopped when about 60 per cent of the monomers have reacted by means of the addition of shortstop. If the reaction were to continue, the proportion of branched chains would rise to an undesirable level. To take the reaction to completion would also result in an uneconomically long period in the reactor system.

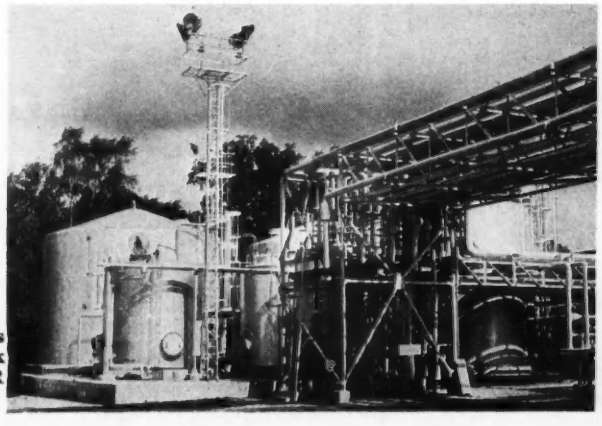
The solid content of the latex so far produced is about 20 per cent by weight; there is also about 10 per cent by weight of unreacted monomers. Butadiene is removed by raising the temperature of the latex to about 120°F and by reducing the pressure in stages to about 200 mm. absolute. The butadiene vapour collected in the pressure flash tanks and the vacuum flash tanks is compressed and condensed and pumped to a recycle butadiene storage tank.

The partially stripped latex goes to a styrene stripping column where unreacted styrene is removed by a process of steam stripping under vacuum. The styrene vapour/steam overhead streams from the columns are condensed and the styrene, separated from the water by decantation, is pumped to the recycle styrene storage tank.

The large styrene stripping columns comprise 14 plates each. With mild steel shells, plates and interior components are of stainless steel to reduce adhesion of the latex.

The blended latex from the latex storage tanks (capacity 125,000 Imp. gall.) is pumped to one of four blending tanks and at this stage oil emulsion may be added to the latex if it is required to produce oil extended rubber. Antioxidant is also added in emulsion form to protect the rubber after coagulation when the wet crumb is being dried.

Coagulation takes place under conditions of vigorous agitation. The resulting crumb and serum overflow into a second agitated vessel known as the soap conversion tank. From this, the slurry overflows to a vibrating screen where



Miscellaneous chemicals tank farm at the ISR plant

the serum and coagulum are separated. The coagulum falls from the end of the vibrating screen into a reslurry tank where it is washed by the addition of dilute filtrate from the filters.

The slurry from the reslurry tank overflows to a rotary vacuum filter where the aqueous phase is removed partially by the action of the vacuum and partially by externally applied squeeze rolls. The cake of rubber crumb then formed discharges to a hammer mill where it is broken down once more into discrete crumbs. These are fed pneumatically to the top conveyor of a large three-conveyor Mitchell drier. Moisture content of the crumb on entering the drier is of the order of 50 per cent/wt. on the dry rubber and in passing through the drier is reduced to about 0.5 per cent/wt.

The rubber is then fed via automatic weight scales to balers which produce an 80 lb. bale of synthetic rubber. These bales pass via a metal detector to either film wrapping machines or dusting and bagging machines. In the former, polythene film is automatically wrapped round the bales and heat-sealed.

In the finishing area there are four trains of equipment in parallel, i.e., four coagulation tanks, four rotary vacuum filters, four driers, etc., until the baling stage is reached when two-train operation is resumed.

In construction, steel framing with asbestos cladding and glazing was used for process buildings and curtain walled panelling for administration buildings. The outfall is a 48 in. steel pipe, lined and wrapped, 10,034 ft. long, supported on wood piles across the foreshore.

ISR's reactor control room, with instrumentation by Taylor Controls Ltd.

A feature of the 50 miles of pipeline within the plant boundaries is the use of mild steel to bring salt water to the various points of use. It was decided to use mild steel following the experience of Esso at Fawley, where this material has been conveying sea water for 10 years without trouble. Service pipes are colour-coded throughout their length. In addition, all pipes carrying materials for use in production are colour banded at intervals, the bands being accompanied by code letters.

The three grades of synthetic rubber now available from ISR are: INTOL 1500, 1502 and 1710. INTOL 1500 is emulsion polymerised using a rosin acid soap and stabilised with Wingstay S (a styrenated phenol), a non-staining anti-oxidant made at the new Wolverhampton chemicals factory of Goodyear Tyre and Rubber Co. (Great Britain). It is said to have the highest physical properties and to develop good building tack. Recommended uses include tyres, camelback, hard rubber, moulded and extruded goods.

INTOL 1502 is emulsion polymerised using a mixture of fatty and rosin acid soaps. It is also stabilised with Wingstay S and is high tensile, abrasion resistant and flexible. It is recommended for white sidewalls, shoe soles, sporting and medical goods, mechanical goods, floor coverings and other items where minimum discoloration and staining are required.

INTOL 1710 has been extended with

(*Continued on next page*)

37.5 parts aromatic oil to 100 parts polymer. It is also emulsion polymerised using a mixture of fatty and rosin acid soaps, and stabilised with Wingstay S. The oil extender gives easy processing characteristics and permits the use of a tough and high viscosity base polymer so that the resulting material has good physical properties at low cost. Uses include tyres, camelback, moulded and extruded goods.

Included in the civil contracting list were the following: Semtex Ltd., Quickset Water Sealers Ltd., British Bitumen Emulsions Ltd., Burt, Boulton and Haywood Ltd.

Sub-contractors to Matthew Hall and Co. Ltd., included: Joseph Nadin Ltd., Richardson Scale Co. Ltd., Alley and Maclellan (Polmadie) Ltd., Thomas Ash and Co. Ltd., Mather and Platt Ltd., Baird and Tatlock (London) Ltd., Dorr-Oliver Co. Ltd., Metropolitan Vickers Electrical Co. Ltd., Norman Engineering Co., Siemens Edison Swan Ltd., L. Sterne and Co. Ltd., Worthington-Simpson Ltd., Ames Crosta Mills and Co. Ltd., Belmos Co. Ltd., Birmingham and Blackburn Construction Co. Ltd., L. A. Mitchell Ltd., Gwynnes Pumps Ltd., Newton Chambers and Co. Ltd., Enamelled Metal Products Corporation (1933) Ltd., Prodorite Ltd., Permutit Co. Ltd., The Pyrene Co. Ltd., Redler Conveyors Ltd., Turner and Brown Ltd., Kirk and Co. (Tubes) Ltd., Ashmore, Benson, Pease and Co., Yorkshire Imperial Metals Ltd., Dunlop Rubber Co. Ltd., Triangle Valve Co. Ltd., Richard Klinger Ltd., CPC (Southampton) Ltd., John Thompson Water Tube Boilers Ltd., Medway Paper Sacks Ltd., John Thompson-Kennicott Water Softeners Ltd., Paper Sacks Ltd., Newalls Insulation Co. Ltd.

Matthew Hall principal field purchase order suppliers included: Murex Welding Processes Ltd., The General Electric Co. Ltd., Esso Petroleum Co. Ltd., British Oxygen Gases Ltd., Staveley Iron and Chemical Co. Ltd. Anglo-American Synco Corporation Ltd., Burton Delingpole and Co. Ltd., Crane Packing Ltd. Chemidus Plastics Ltd., Hawke Cable Glands Ltd., Enamelled Metal Products Corporation (1933) Ltd., Towler and Son Ltd., Audley Engineering Co. Ltd., Lockers (Engineers) Ltd., Trent Valve Co. Ltd., Richardson Scale Co. Ltd., Stockdale Engineering Co. Ltd., W. and T. Avery Ltd., Crosby Valve and Engineering Co. Ltd., Reed Bros. (Engineers) Ltd., Sigmund Pumps Ltd., Robert Jenkins and Co. Ltd., Fisher Governor and Co. Ltd., W. P. Butterfield Ltd., Construzione Meccaniche, Milan, Silica Gel Ltd., A. F. Craig and Co. Ltd., Coventry Climax Engines Ltd., S. Dixon and Son Ltd., Dewrance and Co. Ltd., Coley Thermometers Ltd., Saunders Valve Co. Ltd., Hayward Tyler and Co. Ltd., Electronic Instruments Ltd., Fielden (Electronics) Ltd., Wallace and Tiernan Ltd., Ruston and Hornsby Ltd., Taylor Controls Ltd., Talbot Stead Tube Co. Ltd., Burnett and Rolfe Ltd., Holophane Ltd., W. C. Holmes and Co. Ltd., George Wimpey and Co. Ltd.

ABCM Annual Report

(*Continued from page 633*)

by the present method. A suitable test for chlorinated hydrocarbons had still to be found.

The voluntary notification and clearance scheme for toxic chemicals used as pesticides appeared to be working satisfactorily. Two panels set up to prepare guidance notes on toxicity data and residue data to be submitted in support of a notification had almost completed their work.

Reporting on the work of the trade effluents committee, it was stated that the chemical industry required about 970 million gal. of water a day. Comprehensive figures of water needs and volumes of effluent discharged from individual works of 94 per cent of ABCM membership had been made available to the Ministry of Housing to assist the work of the Central Advisory Water Committee.

Member firms had provided the major industrial contribution, amounting to £6,000 a year for seven years, for the new co-operative scheme of trade effluent research inaugurated by the Federation of British Industries and the DSIR Water Pollution Research Board.

The period during which river boards were restricted from prosecuting alleged polluters under the Rivers (Prevention of Pollution) Act 1951 was being extended for three years until 31 July 1961. It was unlikely that a further extension would be granted. Although 45 members were engaged on research into the treatment and effect of their trade effluents, more fundamental information was needed on the effect of discharged effluents. It was for that reason that the association had wholeheartedly supported the FBI/DSIR research scheme.

The Ministry's standing committee on synthetic detergents had made a progress report describing research being carried out by manufacturers and their endeavours to overcome disposal difficulties. The real difficulty was to devise a detergent which could be produced from raw materials available in quantity and at a cost comparable with existing products, but which would be destroyed by present sewage treatment methods.

In connection with the British Railways' proposed new scheme of labelling for dangerous goods, the association's traffic committee took the initiative in arranging joint discussions with BR and the Ministry of Transport. Much progress had been made, as a result, by way of harmonisation in the form of labels to be used for rail and sea transport. Meantime, BR had deferred the introduction of their original scheme.

Owing to the success of the packaging conference held at Buxton in March 1958, the packaging committee provisionally proposed to organise a second conference in the autumn of 1960.

A report on the possibility of formulating a method of measuring productivity in the chemical industry was presented by Mr. M. Viviani, ABCM work study and productivity officer. The productivity committee recommended that this report be published.

It was stated that in future the council intended that membership would be open to UK incorporated companies that were bona fide producers of chemicals on a substantial scale in this country, even if foreign controlled. Producing operations must be on a reasonable scale; firms that were mainly selling agents would not be eligible. 'Manufacture' was deemed to exclude merely mixing, compounding, tabletting or packaging of bought products and in the case of foreign controlled applicants, the final simple stage of chemical processing of complex products that had undergone the main stages of their manufacture abroad.

Data collected for the preparation and issue of a second supplement to the ABCM 'Report on the Chemical Industry,' based on the position as at the end of 1956 have been collected.

Publication of the final report, now nearing completion, had been delayed.

Liquid Chlorine Plant

(*Continued from page 639*)

Smith and Co. Ltd.—electrical plant; British Thomson-Houston Co. Ltd.—rectifier plant and associated switchgear; J. and E. Hall Ltd.—chlorine refrigeration plant; Constructors John Brown Ltd.—instrument installation.

Subsidiary Contractors and Suppliers:

Anderman and Co.—stoneware pumps and towers; W. and T. Avery.—weighing machines; Avonmouth Engineering Service Ltd. and H. Balfour and Co. Ltd.—mild steel fabricated vessels; Belmos Co. Ltd.—medium voltage multi-motor control boards; Bertram Thomas, Engineers, Ltd.—short circuiting switches; Wm. Boby and Co. Ltd.—water treatment plant; Thomas Bolton and Sons Ltd.—copper busbars; Broom and Wade Ltd.—air compressors; Brown Fintube (Great Britain) Ltd.—heat exchangers; British Acheson Electrodes Ltd.—graphite components for electrolytic cells; British Rototherm Ltd.—instruments; Braithwaite and Co. (Structural) Ltd.—mild steel sectional tanks; B.T.H. Ltd.—electric motors and loud hailing equipment; Budenberg Gauge Co. Ltd.—instruments; Bullers Ltd.—insulators; W. H. Capper.—mild steel fabricated pipework; Chatwood Safe and Engineering Co. Ltd.—process pumps; Communication Systems Ltd.—PAX telephone equipment; A. F. Craig and Co. Ltd.—heat exchangers; Crompton Parkinson Ltd.—motor generating equipment; Crosby Brothers Ltd.—diesel alternating equipment; Davenport Engineering Co. Ltd.—cooling water towers; Davey Paxman Ltd.—mild steel fabricated tanks and towers; Dexine Rubber and Ebonite Ltd.—rubber lining; Dunlop Rubber Co. Ltd.—rubber lining; Doulton Porcelain Ltd.—porcelain insulators; Edward Holme and Co. Ltd.—pushbutton control units and contactor control gear; Electronic Instruments Ltd.—instruments; English Electric Co. Ltd.—fused switchgear and distribution boards; Fisher Governor Co. Ltd.—instruments; Foster Wheeler Ltd.—heat exchangers; Fodens—tanker chassis; Foxboro-Yoxall Ltd.—instruments and panels; James Gordon and Co. Ltd.—desuperheating equipment; Gwynnes Pumps Ltd.—cooling water pumps; F. Haworth Ltd.—chemical brick lining; Heppenstall and Sons Ltd.—mild steel fabricated tanks; Wm. Hodgson and Sons Ltd.—weighing machines; Honeywell Brown Ltd.—instruments; Hurst Nelson Ltd.—rail tankers; Robert Jenkins and Co. Ltd.—mild steel fabricated tanks; Kestner Evaporator and Eng. Co. Ltd.—process pumps; L. K. Kuback.—pressure filters; Lawrence Scott and Electromotors Ltd.—variable speed electric motors; L. A. Mitchell Ltd.—stoneware process pumps; M.A.N.—fabrication of electrolytic cells; Mather and Platt Ltd.—mild steel fabricated pipework and mulsifyre equipment; R. Marsh—lead lining; Metropolitan Vickers Electrical Co. Ltd.—switchgear; Herbert Morris Ltd.—lifting equipment; Murex Arc Welding—welding equipment; Murray and Ramsden—rubber lining; McAndrew Wormald—thermal insulation; New Western—instrument panels; Wm. Neill and Son (St. Helens) Ltd.—mild steel storage tanks; Nelson Engineering Co. Ltd.—low voltage transformers; Nife Batteries Ltd.—emergency lighting equipment; R. Noble and Co.—heating and ventilating equipment; Norman Engineering Co. Ltd.—compressors; C. A. Parsons and Co. Ltd.—distribution transformers; Pipeweld Ltd.—mild steel fabricated pipework; Pirelli General Cable Co. Ltd.—distribution cables; Powell Duffryn Carbon Products Ltd.—graphite components for electrolytic cells; Pulsometer Engineering Co. Ltd.—process pumps; W. G. Pye and Co. Ltd.—instruments; Redferns Ltd.—rubber lining; Rubery Owen Ltd.—machined components; Rotameter Manufacturing Co. Ltd.—instruments; J. Sadler Ltd., R. K. Saxton and Co. Ltd.—mild steel fabricated tanks; Sigmund Pumps Ltd.—process pumps; Silvertown Rubber Co. Ltd., St. Helens Cable and Rubber Co. Ltd.—rubber lining; Stewarts and Lloyds Ltd.—mild steel fabricated pipework; John Thompson Ltd.—mild steel fabricated vessels; John Thompson—structural steelwork; Towler and Sons Ltd.—mild steel fabricated tanks; Wallace and Tiernan Ltd.—chlorination equipment; Wharton Crane and Hoist Co. Ltd.—lifting equipment; Henry Wiggin and Co. Ltd.—Monel tube and plates.

ICI and the Comet

Titanium for components in the Rolls-Royce 'Avon' engines and for several major structural assemblies of the De Haviland Comet 4—including top skinning over inner and outer engines, transverse and spar bulkheads, engine seal rings, rear air intake ducts, engine cowl doors and firewalls—is being supplied by ICI Metals Division.

GAS COUNCIL REPORTS FALLING EXPORT DEMAND FOR CHEMICALS

Big Drive for New Gas-making Processes

OUTSTANDING feature of the annual report of the Gas Council for the year ended 31 March 1958 is the progress which has been made in the practical development of new processes and sources for the supply of gas.

The council's research programme which has cost £777,505 (£529,256), has been mainly directed to processes which can make use of poorer quality coals or alternative raw materials. Research has also continued on methods of improving the efficiency of carbonising plant. Other subjects of research are the purification of gas, the disposal of effluents, the utilisation of gas both by industry and in the home, and the quality of coke.

Prominent among the projects which have been started is the installation at the Partington works of the North Western Board of a full-scale commercial plant for the gasification of oil by the high pressure hydrogenation process developed at the Gas Council's Research Station at Solihull. Another development of this research is the construction by the South Western Gas Board of plant for the hydrogenation of light petroleum distillates at Bristol. At Westfield, Fife, the Scottish Gas Board is building a works for the complete gasification of coal at high pressure. The plant will use poor quality coal and the Lurgi process. Erection of the works will be in two stages. The first stage is expected to be completed in July 1960, and the second stage two years later. This second stage will incorporate a hydrogenation process of the Midlands Research Station by which light petroleum spirit will be gasified in a stream of gas rich in hydrogen. This will produce large quantities of high-quality benzenes.

Largest Gasification Plant

Largest of the projects at present in progress for the gasification of oil is that of the South Eastern Gas Board at the Isle of Grain, Kent. A new works, adjoining the oil refinery of the British Petroleum Co. Ltd., is being built, and the first stage of the installation, with a capacity of 20 million cu. ft. of gas a day, is expected to be completed and in operation by the autumn of 1958. Further stages will take the installation to a capacity of 60 million cu. ft. a day. For the first stage, the process will be the catalytic Segas process, developed by the South Eastern Gas Board. For the later stages a new process developed by Shell Petroleum Co. in their research laboratories at Amsterdam will be used. The latter process consists of a partial combustion of oil with oxygen and steam under a pressure of 300 p.s.i. The resultant gas will be of relatively low calorific value but high in hydrogen and it will be mixed with the high calorific gas from the Segas plant to provide normal town gas of 500 B.Th.U. to the cu. ft.

At the end of the year 25 oil gasification plants were in operation, 11 new installations having come into commission during the year. Fourteen other plants were under construction or on order. When completed, total capacity of all oil gasification plants will be 120 million cu. ft. a day, with a saving in coal of the order of 400,000 tons a year.

An important part of the South Western Gas Board's constructional programme is at Gloucester, where plant for four distinct processes—three for the manufacture of gas from oil and one for the complete gasification of coal—is being installed. The 2.8 million cu. ft. a day plant for gasification of coal by the French process, known as the Gaz Integrale, was almost complete, as was also a plant of 1 million cu. ft. capacity for the gasification of oil by the American Hall process. The small experimental Koppers Hasche plant intended for reforming propane, butane and low-boiling petroleum fractions was completed during the year under review. The remaining process is the Jones oil gasification process, which produces carbon black, and gas of low calorific value. A second 1 million cu. ft. Jones plant, finished early in 1957, has been in operation throughout the year.

Capital Spending

Capital expenditure in 1957/58 on fixed assets was £55.7 million, £22.7 million of which went on manufacturing plant. Amounts approved for 1958/59 are £53.5 million and for 1959/60 £47 million.

The experimental plant under erection at the Stratford Works of the North Thames Gas Board for manufacture of gas by the homogenous reaction of oil and superheated steam was nearly completed by the end of the year. Little is known of the mechanism of the hydrocarbon-steam reactions in which catalysts play an important part and investigations have been started by the London Research Station to gain more information.

Three main objections are being pursued in gasification of coal at high pressures: pressure gasification of coal in fixed fuel beds, production of gas by hydrogenation of coal, and pressure gasification of coals and char in fluidised beds. Two main lines of investigation are being followed at the Midlands Research Station in connection with hydrogenation of oil: laboratory work is being continued to explore the operation of the oil hydrogenation process over a wider range of conditions with special reference to the nature of the oil used, composition of the gas produced and the effect of various pressures; work is also proceeding on the development of a pressure reformer for the production of hydrogen-rich gas for hydrogenation.

Purification of gas is under investigation. Attention is being devoted to devising other methods for removal of spent oxide. One method is the arrangement of iron oxide on trays in tower purifiers. A special study is being made of operating temperatures in tower purifiers by the South Eastern Gas Board.

As another method of removal of hydrogen sulphide, liquid reagents containing zinc or copper compounds have proved effective in a plant of the North Thames Board, and a larger plant to deal with ¾ million cu. ft. of gas a day has now been completed.

Another process which is being developed for the removal of hydrogen sulphide when carbon dioxide is present in relatively high concentrations in the gas, as it may when the gas is made under high pressure, is the methylene blue process of the South Eastern Board. Following successful laboratory investigations, trials are now to be made in a pressure pilot plant unit at the Sydenham works of the board. The process is continuous, resulting in the direct recovery of free sulphur and the regeneration of the methylene blue for further use.

Pilot-Plant Studies

Some of the liquid reagents proposed will recover hydrogen sulphide in the form of a gas mixture containing also carbon dioxide and hydrogen cyanide. Promising results on pilot-plant scale experiments to convert the hydrogen sulphide into elemental sulphur have been obtained with new kinds of catalysts.

Net revenue from products other than gas was £99.5 million, of which £84.6 million came from coke and breeze and £14.9 million from tar, benzole and other chemical products.

Home trade for chemical products was fairly stable, but the general trend in export business, under the influence of increasing competition from Russia and Eastern Europe, and also the recession in the US, was one of falling demand, and in many cases, lower prices.

The quantity of crude coal tar made was less than the quantity made in the previous year, i.e. 1,830,200 tons compared with 1,920,900 tons, due to the smaller quantity of coal carbonised. Crude oil gas tar made at 86,800 tons was more by 25,000 tons. Tars are now being produced in significant quantities as by-products of oil-gasification processes. Total quantity of crude tar sold by the boards was 1,435,200 tons compared with 1,501,200 tons in 1956/57. In addition, 532,500 tons of crude tar were used by the boards mainly for manufacture of refined tar products.

Demand for coal tar pitch was generally steady and the production was fully sold. Also, in spite of competition from petroleum fuel oil, production of coal tar fuels was fully sold.

Home markets for most of the other tar products remained firm for the

greater part of the year, and demand for crude naphthalene for the manufacture of phthalic anhydride and for phenols for plastics and plasticisers was good. Competition overseas is reported as having been extremely keen, with trade adversely affected by very low-price material from East Europe.

The total quantity of crude benzole extracted by area boards was slightly below the previous year's total—27,836,000 gall. compared with 28,550,000 gall. (again due to the smaller quantity of coal carbonised). The quantity of crude benzole refined by the boards at 13,001,000 gall., was a little less than the quantity in 1956/57, i.e. 13,019,000 gall. Direct sales at 13,810,000 gall. were 131,000 gall. more.

During the year, the price for benzole weakened, which in turn had a depressing effect on the price of toluole. Demand for xylole remained strong and the price tended to rise. Direct sales of xylole at 467,000 gall. were 56 per cent higher than in 1956/57.

Demand for sulphate of ammonia for spring fertiliser dressing was exceptionally good. The total quantity sold in 1957/58 was much the same as that sold in the previous year—80,100 tons compared with 82,700 tons.

As a result of demand for ammoniacal gas liquor as fertiliser several boards doubled the quantity of liquor which they had supplied in the previous year. Demand over the last five years has been as follows:—

	Million gall.
1953/54	6.3
1954/55	8.1
1955/56	15.1
1956/57	20.6
1957/58	35.0

Further falls in the c.i.f. prices of both brimstone and pyrites brought about substantial reductions in the price of spent oxide. The total quantity sold was 224,500 tons, compared with 209,300 in the previous year.

Orrs' Zinc White Achieve a 'Better Production Balance'

MR. M. I. FREEMAN, director of operations, Orr's Zinc White Ltd., Widnes, at the annual distribution of long service awards on 8 October, said that lower income and increased costs meant that the firm was being squeezed at both ends of the scale. They were far from dismayed at this. The present position of the company was that three-quarters of the income came from the sale of lead and zinc.

It would be well to remember that the decline in sales of lithopone had been made up by other products. The research department had been able to produce a better production balance involving barium and zinc sulphide, and that was a very important contribution.

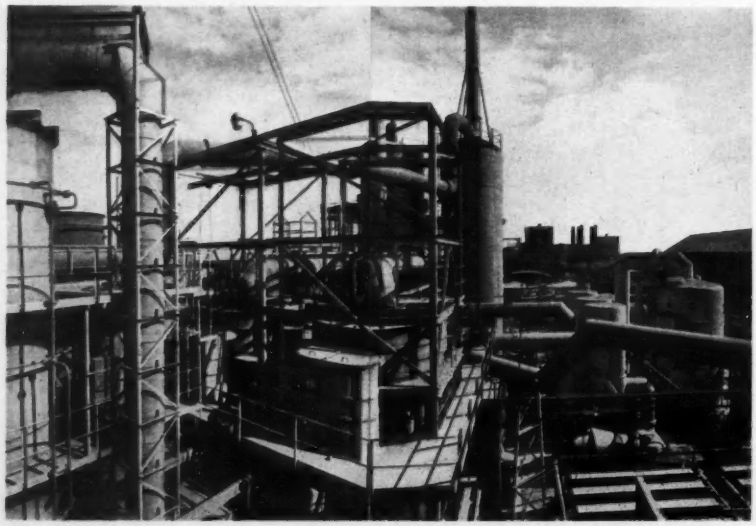
Open Days at Glos. Equipment Works

OPEN DAYS at the Stroud, Glos. works of T. H. and J. Daniels Ltd. attracted 250 visitors, many from the chemical, plastics and rubber industries. The item that aroused most interest was the Daniels/Latymer 30/30 RDP vacuum forming machine, the first of its type in the UK.

Other equipment of interest included exhibits by B.B.A. Ltd., an associated company that manufactures heat exchangers and other steam equipment; dust collecting equipment, fume washing plants, fans and gas handling gear, by Prat-Daniel Ltd. (Stanmore) Ltd.

Visitors saw boiler control equipment being made for James Gordon and Co. Ltd., Stanmore, and centrifugal separating machines for Sharples Centrifuges.

Chemico Sulphuric Plant for British Titan



This new contact sulphuric acid plant has recently been commissioned for British Titan Products at Grimsby. By Chemical Construction (GB) Ltd., it will produce 180 tons a day of sulphuric acid

Determination of Furfural by Bromatometric Method

A BROMATOMETRIC method for the determination of furfural and of 5-hydroxymethylfurfural in Tollens distillates is reported by Per Olof Bethge, wood chemistry department, Swedish Forest Products Research Laboratory, Stockholm, Sweden (*Svensk Papperstidning*, 1958, **61**, No. 18, 565). Tollens distillates, obtained in pentosan determinations, consist of a solution of furfural and of 5-hydroxymethylfurfural (HMF) in hydrochloric acid. Bethge shows how the total concentration of these two aldehydes can be determined by bromatometric titration.

A portion of the distillate is taken and the total concentration of furfural and HMF (expressed as millimoles/l). Another portion (100 ml.) of distillate is placed in a separating funnel, 25.0 ml. of chloroform, previously shaken with water, is added and the whole shaken for one minute. The funnel is then placed in a water bath at 25°C for 10 minutes, then shaken again for one minute. The phases are allowed to separate. The chloroform phase is discarded and 50 ml. of the aqueous phase is used for the determination of the total concentration of furfural and HMF.

If the distillate is titrated again after the extraction, it is stated to be possible to estimate the concentrations of HMF and of furfural separately provided the distribution coefficients are known.

The extraction procedure is reported by Bethge to give good results and to be less laborious and time consuming than the double distillation procedure given Cellulosa industriens Centrallaboratoriums Analyskommitté, *Svensk Papperstidning*, 1951, **44**, 26).

Where many samples of the same kind are to be analysed, it will be found that the HMF concentration varies very little. If the furfural concentrations are reasonably high compared to those of HMF, very little precision will be lost, Bethge states, if only the sum of the HMF and the furfural is determined and an HMF-correction, based on a limited number of HMF-determinations, is applied.

Site Chosen for ICI's US Fibres Subsidiary

The new corporation owned jointly by Imperial Chemical Industries Ltd. and the Celanese Corporation of America is to be known as Fiber Industries Inc. A 215-acre site near Shelby, North Carolina, has been chosen for the multi-million pound fabric factory. The two companies expect to spend about $50 million (nearly £18 million) on building the plant.

Magnifying a Millionfold

The Dutch headquarters of the Philips organisation has claimed to have developed a microscope which permits 1 to 2 million-fold magnification. The microscope is soon to be put on the market and Philips will issue further details about it later.

Polarography Meeting in Scotland—2

Chelating Power of EDTA and Some Closely Related Agents Examined

ON investigating the properties of some homologues of ethylenediamine tetraacetic acid (EDTA) and other aminopolycarboxylic acid, Mr. W. Hoyle and Dr. T. S. West, Chemistry Department, The University, Birmingham, found it necessary to evolve a rapid method for estimating the chelating power of these reagents.

It is well known that the polarographic wave for the aquo-ion complex of simple metal cations is shifted towards more negative potentials when the ion enters into chelate formation. Of the several methods available for relating the induced shift in the half-wave potential to the instability constant of the complex thus formed, the most attractive method appeared to be that in which the half-wave potential of the chelate wave was measured in the presence of varying excesses of the reagent. The dissociation constant of the chelating acid and its concentration only are necessary to calculate the desired $\log_{10}K$ value. Aqueous solubility of EDTA and similar reagents is sufficiently low, however, to preclude the use of this method and moreover the electrode reactions are not fully reversible. It was therefore decided to establish a standard curve relating experimentally observed $E_{\frac{1}{2}}$ values to known chelation constants and to use this as a means of estimating unknown K values for new reagents.

Rapidity and Simplicity

Advantages of the method are extreme rapidity and simplicity. Very little material is required and determination of the relative strengths of the reagents still in reaction mixtures or after separation as a spot on paper by techniques such as electrophoresis is possible.

Hoyle and West report that in setting up such a chelate scale several factors must be considered in selecting a suitable cation:

(1) Low pH to decrease stability of the chelate; (2) low $E_{\frac{1}{2}}$ value of cation for wide working range between $E_{\frac{1}{2}}$ for unchelated cation and hydrogen wave; (3) the cation should give only one wave; (4) the cation should allow reasonable movement of $E_{\frac{1}{2}}$ on chelating with a strong reagent without merging with hydrogen wave; and (5) the chelate formed with the weaker chelating agents, must not break down at the selected pH.

Zinc, nickel and cobalt give no chelate wave with EDTA at pH>2.7: (ie, wave lies beyond H_2 wave) thallium I, arsenic III and molybdenum VI do not fulfil conditions (3) or (4); chromium III and tin II are also not suitable (condition 3). Copper II and cadmium were selected for further investigation.

The half-wave potential of the Cu^{2+}/EDTA chelate depends on several factors, e.g., pH, ionic strength, temperature, concentration of chelate, excess of chelating agent, concentration of buffer, etc. These variables all require control.

In 0.4 M acetic acid all chelating agents were found to give a single wave which required the use of a maximum suppressing agent. Gelatin appeared to be the most effective of these. The greater the stability of the chelate, the lower the necessary concentration of gelatin. A final concentration of 0.025 per cent was chosen (minimum required for suppressing maxima with the weaker reagents). The cupric chelate of dihydroxy ethyl glycine (DHEG) with $E_{\frac{1}{2}} = -0.02$ and $\log_{10} K = 8.1$ was chosen as arbitrary (zero) reference point, and a standard curve relating observed $\Delta E_{\frac{1}{2}}$ values to known $\Delta\log_{10}K$ values was established.

About 20 aminopolycarboxylic acids of the 'complexone' type were investigated in setting up this standard curve. A list of estimated instability constants for some new chelating agents has been established as a result of this work.

A number of chelating agents (particularly some of the stronger ones) showed unusual 'reversed current' behaviour at the dropping mercury electrode. Before the $E_{\frac{1}{2}}$ value for the polarogram, these chelates behaved in such a way that the current was observed to decrease as the drop size increased and to increase immediately the new drop began to form. Before the limiting current was reached the normal pattern of behaviour was observed. The point of change over was indicated by a sharp kink in the polarogram. It is considered by Hoyle and West that this phenomenon is probably associated with variable gelatin coverage of the surface of the mercury drop during its lifetime.

Cadmium is less satisfactory than copper for setting up a chelate scale because of the lower stability of the chelates of this cation and the more cathodic value of the $E_{\frac{1}{2}}$ value for the unchelated ion. The Cd^{2+}/EDTA polarogram (*p*H 2.6) shows two waves, the first of which corresponds to free cadmium ion and the second to the Cd^{2+} chelate.

Polarograms have been determined on a range of the more powerful chelating agents with cadmium in 0.4M acetic acid at *p*H 2.5 $\pm$0.1 without the use of a maximum suppressing agent. Most of the polarograms show twin waves that are due to the chelate and the other free Ca^{2+} ions. For reagents such as CDTA viz., 1,2-diaminocyclohexane-N,N, N′, N′—tetraacetic acid (and some of the yet more powerful chelating agents devised by the authors) no free cadmium wave could be observed. Also, the half-wave potential of the second wave became more negative and for more powerful reagents difficulty was found in determining $E_{\frac{1}{2}}$ because the diffusion current of the chelate merged with the start of the hydrogen wave. A Cd^{2+} chelate scale corresponding to the Cu II scale was not set up as sufficient data are not available.

With this very rapid method for estimation of chelating ability of new reagents on quite minute amounts of material (e.g. on extracts of paper electrophoreograms)—it has proved possible to obtain fairly precise data on the chelating power of new reagents in a matter of a few hours rather than the weeks it would have taken by more customary methods. This data could usually, though not always, be obtained on the reaction mixture itself without previous isolation of the reagent.

Hoyle and West's Paper Discussed

Dr. F. J. C. Rossotti, University of Edinburgh, suggested that the theoretical basis of Hoyle and West's undoubtedly useful linear correlation was not readily apparent, as it would appear to require polarographic measurements of different complexones at the same free ligand concentration, a condition which was apparently not fulfilled. Dr. Rossotti also considered that a low *p*H decreased the amount but not the stability of a complexone; that inertness and stability were not necessarily parallel, and that the use of 0.025 per cent gelatin in all systems appeared to be dangerous in view of the evidence for competitive complex formation. The stability constants of the acetatocupric complexes were known.

Referring to the first point raised by Dr. Rossotti, Dr. West agreed that this was theoretically correct but that in practice the difference due to variation in free ligand concentration at a constant *p*H was so small as to be incapable of measurement. The *p*K values of all the complexones examined were very close together and any slight variation which might occur due to differences in ionisation were modified considerably by the fact that the change in $E_{\frac{1}{2}}$ value thus brought about was controlled by a logarithmic function of the free ligand concentration.

Dr. West considered that the stability of the bivalent copper-acetate complex was sufficiently low to be insignificant in comparison to the stability of the bivalent copper chelate examined, but nevertheless it was taken into account by basing the shift in half-wave potential on the known stability of the bivalent copper chelate of

dihydroxy ethyl glycine which had a value of $\log_{10}$ K of approximately 8. Dr. West mentioned that they had considered the possibility of competitive action of the gelatin at the concentration of 0.025 per cent to be insignificant; the use of gelatin was unavoidable since the presence of a suppressing agent was absolutely essential and gelatin appeared more suitable than any other agent examined.

Dr. R. J. Magee, Queens University, Belfast, asked why it was necessary to apply the condition that the cation must have only a single wave since this condition rather restricted the metals that could be investigated.

Mr. Hoyle replied that the restriction was mainly one of convenience since it was difficult to interpret phenomena when more than one wave was present. If two waves, corresponding to two valency states, existed then complications might occur due to varying amounts of chelating agent taken up by the two oxidation states of the cation.

Dr. R. A. Chalmers, Aberdeen University, asked whether the chemical evidence for the order of the stability constants was obtained at the same *p*H as the polarographic evidence. Mr. Hoyle replied that the chemical evidence which substantiated the polarographic findings was not obtained at the same *p*H, since the chemical tests depend on inhibition of precipitation, colour formation, etc., and were necessarily carried out under the conditions of acidity which apply to such reactions. Most of the chemical tests were carried out in alkaline solution, whereas the polarography was performed at *p*H 2.5—2.7.

The change in half-wave potential due to a ten-fold variation in concentration of cheltating agent, e.g., EDTA, had been calculated and found to be of the order of 20-30 mv. Thus useful data could only be obtained through using a very wide range of concentrations of chelating agents. This was not possible with EDTA because of the poor solubility of the reagent at low *p*H. Increase of *p*H would have enabled a wider variation of EDTA concentrations to be used, but the reduction wave would probably become complex. This method of approach had the further disadvantage that it required appreciable quantities of chelating agents, which are often only available in small amounts.

New Wiggins Booklet on Nickels and Alloys in Plant Processes

PROPERTIES of high-nickel alloys used in the construction of plant handling caustic soda and illustrations of some typical applications are contained in the publication 'Wiggin Nickel Alloys v. Caustic Alkalies' produced by Henry Wiggin and Co. Ltd., Wiggin Street, Birmingham, 16. The nickel alloys dealt with are Monel, 'K' Monel, Inconel and Nimonic 75. The extensive data contained in the Wiggins publication gives comparative corrosion rates from a large number of laboratory and plant tests, and form a useful guide in the selection of the best grade of nickel or nickel alloy to be used.

In the continuous vacuum concentration and production of anhydrous caustic soda using Dowtherm as a heating medium, low-carbon nickel and nickel-clad steel components are reported as giving satisfactory service as evaporator tubes, tube sheets and shells and as receiving tanks and piping, and in equipment for continuous vacuum evaporation of mercury cell caustic potash from 73 to 92 per cent concentrations at a temperature of 316°C (600°F).

Low-carbon nickel or nickel-clad steel can, in some cases, be used for the construction of batch caustic pots or caustic fusion pots when sulphur or sulphur compounds are not present in the caustic. As nickel is subject to intergranular attack by sulphur or sulphur compounds at temperatures exceeding about 316°C (600°F), it cannot be used for caustic evaporating pots where sulphur shading is carried out or for caustic fusion vessels where sulphur compounds are present and wall temperatures exceed 316°C (600°F). Similarly, solid nickel and low-carbon nickel are not suitable for direct-fired vessels where the fuel contains appreciable sulphur. The use of clad steel is suggested with the steel side exposed to the heating gases and the nickel side exposed to sulphur-free caustic.

Up to 538°C (1000°F) Inconel is stated to be resistant to attack by reducing sulphur compounds and to oxidising sulphur compounds up to about 816°C (1500°F). Therefore, in fusion vessels involving sulphur compounds, use of Inconel or Inconel-clad steel instead of nickel may be preferable. Welded Inconel or Inconel-clad steel for this service should be annealed before use.

Transportation facilities to provide the same care in handling caustic as in ensuring high purity in its production have grown in importance. To avoid solidification, of caustic of 70 to 75 per cent strength during shipment, the caustic must be loaded hot and kept hot during shipment. Nickel-clad steel tankers are suggested as offering particular advantages in this respect. Also, use is made of nickel steam coils for keeping the caustic hot during shipment and of nickel heat exchangers, pumps and piping in unloading cans of 70 to 75 per cent caustic. Data showing corrosion effects on nickel-clad steel are available from Henry Wiggins and Co. Ltd.

Imports of Piperazine

No case has been made out for anti-dumping duties on imports of piperazine from France, Italy and Sweden, the Board of Trade announces. Piperazine is used in medical and veterinary practice and in the production of dyestuffs.

Copper Sulphate Makers Concerned at Fall in Demand

OVER the past year, demand for copper sulphate was exceptionally low. The chairman of the British Sulphate of Copper Association, Mr. J. D. McKechnie, said at the association's annual meeting that this fall in demand was due mainly to a carry-forward of stocks from the previous year. The situation had become worse than had been expected. A more intensive competition for the smaller tonnage required by consumers had resulted and there was now too much sulphate for the demand.

The struggle for orders by producers has been aggravated by the continued fall in the price of copper during the first half of the year, making buyers hold off until nearly the moment of consumption. Another factor which has reduced the sales potential, particularly as regards the Snow grade, has been the changeover from Bordeaux mixture to oil on the banana plantations. The association says that it is too early to know whether oil will in time supersede copper sulphate for banana spraying, but considerable inroads are stated to have been made into dollar markets already.

The value of total exports amounted to £1½ million—'a very serious reduction compared to the previous year.' Generally, reports Mr. McKechnie, political and economic conditions have made business more difficult and in some cases orders have been lost through the non-availability of sterling.

Growing Competition

Mention is made of growing competition from other products, particularly those that can be easily mixed for spraying and can be applied at low volume, with a consequent saving in the cost of application. The association has been investigating low volume spraying for some time and has had trials carried out successfully using Bordeaux and Burgundy mixtures as low volume sprays.

Evidence of insufficient spraying was the presence of a great deal of potato blight during the year. Sprays with good sticking qualities were required, particularly in wet weather. Bordeaux mixture was renowned for its adhesive properties and its use, suggested Mr. McKechnie, should be further encouraged now that it had been proved that it could be used as a low volume spray.

A great deal of experimental work had also been done on the control of water weeds and it had been shown that small concentrations of copper sulphate have successfully eliminated certain types of weed growth. Also, the association has continued to encourage the use of copper sulphate for the control of bilharzia and liver fluke, and the correction of copper deficiency in the soil.

Prospects for this season are regarded as still uncertain, particularly as there are apparently large stocks of copper sulphate still in existence.

Overseas News

REICHHOLD CHEMIE'S SECOND PHTHALIC ANHYDRIDE PLANT NOW BEING BUILT

WORK is in progress on the building of a second plant for the production of phthalic anhydride at the Hamburg manufacturing installation of the West German company, Reichhold Chemie AG. Although the company has not as yet made any announcement of the capacity of the projected or of the existing plant, it is reported that when the second installation comes into operation in the not-too-distant future, the plant's capacity for this commodity will be doubled and supplies to the home and foreign markets rise accordingly.

Reichhold Chemie, which last month celebrated their silver jubilee, is associated with, though not a subsidiary of, the American Reichhold group. Their products, all of which come from the Hamburg works, are traditionally artificial resins and lacquer resins; some years ago, however, the company decided to become more self-sufficient by producing basic materials for the manufacture of resins and allied products. Today it produces more than enough for its own needs and can sell to the industry at large.

A formaldehyde plant is now on full stream. This has a capacity of about 5,000 metric tons a year and supplies a steady need, both within the company itself and on the home market as a whole.

Russian Advice For India's Pharmaceutical Industry

Russian experts have been discussing with the Indian authorities the Soviet Union's offer of technical and financial assistance for the development of the pharmaceutical industry in India. The Russians have visited a number of possible sites for factories. Five different units are said to have been advocated. These are a synthetic drugs factory; plant products research laboratory and plant extraction factory; manufacture of grandular products; manufacture of antibiotics; and manufacture of surgical instruments and electro-medical equipment.

Chas. Pfizer's New Oral Antidiabetic Drug

Diabinese, chemically chlorpropamide (1 - propyl - 3 - *p* - chlorobenzensulphonylurea), which has just been marketed in the US by Chas. Pfizer and Co., for the oral treatment of diabetes, is stated to be twice as effective as the other drugs now available. Also claimed is longer-lasting action and no serious side effects in small doses.

Chemical trials have indicated that the new drug produces an effective result more rapidly than the earlier sulphonylureas and lowers blood sugar levels more with smaller dosages. Increasing the dose of chlorpropamide steadily increases this effect, it is reported.

In a clinical trial of 130 diabetics 108 were stated to be adequately controlled over the course of a year or more. Doses of 0.25 grams per day lowered blood-sugar levels markedly. The drug remained in the blood stream of both normal and diabetic patients eight times as long as tolbutamide, another oral antidiabetic drug.

Chas. Pfizer and also Eli Lilly have applied for patents. Eli Lilly have also been carrying out experimental studies and clinical trials on chlorpropamide.

Dyestuffs in OEEC Countries

Dyestuff production of member countries of the Organisation for European Economic Co-operation (OEEC) rose by 11 per cent to 124,000 metric tons in 1957, reports the dyestuffs working party of the OEEC in a recent report. This was a new record.

For the first time in many years, reports the working party, prices tended towards stability during the year. However, the peak working of industry in general and the textile industry in particular brought with it the fear of a future drop in demand.

More Polyamides Likely from East Germany

First steps are being taken in the expansion of the East German Wilhelm Pieck synthetic fibre works at Rudolstadt. Although no details have yet been released as to the increased production figures, it is said that about Eastmarks 30 million (cross-rates: about DM.7,500,000 (£625,000) will be spent on the extension of the polyamide capacity.

Russia's Developments in Synthetic Fibres

In the Central Institute of the Textile Industry in Moscow a new process developed for the working-up of phtorlon, is stated to improve almost all the qualities of the fibre. At a normal temperature it may now be stretched to 350-400 per cent its normal length; by a glycerin stage in the new process its 'tearability' has been increased to 115 kilogram/millimeter; no change in physical properties occurs at temperatures below 120°C; dissolving in concentrated sulphuric acid now takes 60 days; and it is said to be almost as fade-resistent as nitron and remarkably resistant to chemicals.

A new fibre—Saniv—has been developed as a result of using a new synthetic in the production of nitron fibres (formerly the expensive dimethylformamide had to be used for nitron production processes). Saniv, built up on a copolymer of acrylonitrile and vinylidenechloride, is stated to be immune to acids and may be stretched under high temperatures to many times its normal size.

Isoprene For Synthetic Rubber

A research programme has been put in hand at the Max Planck Institute for Coal Research, Mülheim, West Germany, into the production of isoprene by a metal-alkali process for working into a new type of synthetic rubber. This isoprene-based rubber is said to contain nearly all the advantages of natural rubber which other synthetic rubbers cannot yield.

Second Stage of British American Oil's Plant Completed

The second stage of the British American Oil Co.'s new $25 million plant, which will complete the gas processing and distribute it to industrial and domestic consumers, is ready for operation, it is announced. The plant is capable of processing 120 million cubic feet of gas daily.

Natural gas will be the major product, but as important secondary products, the new Pincher Creek plant will supply condensate for use in the manufacture of gasoline, plus sulphur, butane and propane.

Improved Corrosion Inhibitor For Water Alcohol Solutions

Research at Wyandotte Chemicals Corporation for Wright Air Development Centre, US Air Force, has resulted in the development of an effective corrosion inhibitor for use with alcohol-water injection fluid for aircraft engines. It is stated to inhibit corrosion of steel, stainless steel, and aluminium alloys, is soluble in methanol, ethanol, water or mixtures of the liquids, and lowers surface tension of the mixtures. Although the inhibitor is chemically compatible with hard water solutions, inhibition efficiency is inversely proportional to water hardness. The inhibitor is a mixture of dicyclohexyl-ammonium nitrate, urea and l-nitropropane in an anhydrous methanol solution. Three inhibitor formulations have been devised and data has been obtained from initial screening of 137 corrosion inhibiting compounds. Full details are available in Order PB131781 from Office of Technical Services, US Department of Commerce, Washington 25, DC, US, price $2.25.

Israel's Potash Production

Potash production at the Dead Sea works in S'dom is expected to exceed 100,000 tons in 1958 as compared with 80,000 tons in 1957. In the first nine months of 1958, the company exported 55,000 tons of potash to 12 countries. Among the most recent newcomers to the list of countries buying potash from Israel are Sweden and Norway.

Chemist's Bookshelf

Aliphatic Fluorine Compounds

ALIPHATIC FLUORINE COMPOUNDS. By *A. M. Lovelace, W. Postelnek* and *D. A. Rausch*. A.C.S. Monograph No. 138. Reinhold Publishing Corporation, New York (Chapman and Hall Ltd., London), 1958. Pp. x + 370. £5.

A real need exists for a balanced, critical and comprehensive treatise on organic fluorine chemistry. The topic is now so large and changing so rapidly that the task daily grows more difficult. The present authors wisely decided to limit the scope of their book to aliphatic fluorine compounds, and its stated aim is to give complete coverage of all reported compounds and to review them comprehensively. Adequate coverage is certainly achieved, with '286 different methods of preparation . . . ., over 60 tables . . . ., the physical properties of 4,500 organic fluorine compounds . . . .', and as a compilation of the relevant literature the book is undoubtedly very useful. There is, however, little of the claimed 'critical review of the field's systematic progress'. This absence of criticism, comment, correlation and interpretation, and the presence of far too many factual, typographical, and proof-reading errors spoil this book. It surveys the literature without attempting to propound the basic reasons underlying the whole field. The completely factual approach 'from the point of view of preparative organic chemistry' covers the literature thoroughly to 1955; some 1956 papers are included. No distinction is made between compounds reported in the literature with adequate proof of structure, analytical evidence, etc., and those that are distinctly speculative if not implausible when other well-established reactions are borne in mind.

Tables of physical data can be of great value; they can also be a curse if they contain errors. In this book there are, unfortunately, clear signs of haste and inadequate checking with the original literature, and in one table taken at random over 20 errors of one form or another were found without exhaustive examination. The tables also list all values reported for a particular physical property without attempting to indicate the most accurate value; this non-critical approach is sometimes justified, sometimes not. Thus, the precise boiling points of CF_2Cl_2 and $CFCl_3$ are known, since they are relevant to the use of these compounds in refrigeration or in the aerosol industry; despite this, other boiling points, clearly less accurate on inspection of the original papers, are also reported. Unless a reader has specialist knowledge he is thus forced to read half-a-dozen papers to determine for himself which particular physical property is to be relied upon; surely it is the task of the authors of the book to make such decisions or to give guidance wherever possible? Here, as in other parts of the book, one gets the impression that more use was made of abstracts and a card index system than of the original literature.

Typical errors, taken at random from a long list compiled from the book, are as follows: 'The bromination of $CF_3CH:CH_2$ at 140° yielded $CF_3CHBrCF_2Br$ and the addition of bromine to $C_3F_7CH:CH_2$ .....yielded $C_3F_7CHBrCH_2Br$'. '..... where fluorination of hexafluorobenzene yields $C_6F_4Cl_2$'. 'CH_2CHClF'; '$CCl_2 = CClCl_2F$'; '$(CH_3)_2CHClF$'; '$CH_3CF = NF_2$'. 'Henne and Zimmer isolated CF_3COOBr and CF_3COOI.....'. 'Roylance, Tatlow and Worthington reacted *o*-dichlorobenzene with CoF_3 and $LiAlH_4$ in ether at 0°'. [Fortunately they did not, and so lived to publish important papers on fluorine chemistry].

It is always easy to criticise, but the presence of numerous errors of the above types makes the book difficult to read, and can sometimes be misleading; one has continually to question whether what one has just read is factually correct or not, and how much weight should be given to the evidence. In checking some of the physical data the reviewer noted several places where the references were mixed up.

Yet inherently this could be a good book. The allocation of space among the thirteen chapters (fluorination; alkanes; alkene and alkynes; alcohols; ethers; ketones, etc.; acids; acyl halides; esters, nitrogen compounds I; nitrogen compounds II; organometallics; sulphur compounds) is good and the number of literature references is excellent. The book is well printed and well set out. To write on this subject at all is a formidable job, and one looks forward to a corrected second edition.

R. N. HASZELDINE.

Theory and Practice of Animal Glue and Gelatine Production

CHEMIE UND FABRIKATION DER TIERISCHEN LEIME UND DER GELATINE. By *Prof. Dr. E. Sauer*. Springer-Verlag, Berlin, 1958. Pp. vii + 335, with 140 illustrations. £3 9s 3d.

This comprehensive work on the chemistry and manufacture of animal glues and gelatines is divided into 14 chapters. The first of these gives a systematic classification of adhesive substances, with statistics concerning their world production and use, and an interesting historical survey, dating from their manufacture in ancient Egypt. Then follows a long discussion on the chemistry and structure of proteins, as exemplified by gluten and collagen, and the physical chemistry of gluten, with special reference to its adhesive power. Theories of the adhesive process are discussed. The manufacture of gelatines, which is described by Dr. E. Kinkel, is followed by the manufacture of skin glues and bone glues, the drying of glues, special glues, leather adhesives, fish glues, and casein glues (by Dr. K. Hagenmüller).

A chapter on the testing of gluten adhesives describes the various ingenious devices used for measurement of adhesive power with copious references to German Industry Standards, and discusses experimental techniques for the study of chemical, physical and analytical aspects of glues. Finally, there are a useful summary of German patents, a bibliography, and author and subject indices.

The book provides everything which the technologist requires about animal adhesives, presented in a systematic manner with typical German thoroughness. It is generously illustrated with photographs and excellent diagrams, and is printed on high-quality paper with a pleasing binding and remarkably few errors. The work can be warmly recommended to all engaged in this aspect of chemical technology.

A. R. PINDER.

Problems of Chemical Disinfection

DISINFECTANTS: THEIR VALUES AND USES. By *W. E. Finch*. Chapman and Hall, Ltd., London, 1958. Pp. 188 + plates xiv. 30s.

A survey of the problems of antisepsis and disinfection in relation to the chemical compounds available for their solution is timely, for in no department of public health has superstition so blatantly led science by the ears as in this. The moral, if we may seek one, of this book is that the disinfectant must match the infecting organism and its peculiar environment. The author discusses the individual agents available, their mode of action on micro-organisms, and their shortcomings in the uses to which they are put. Being engaged in the commercial production of disinfectants, he is able to treat formulation and standardisation from the practical angle, and deals mainly with phenolic and substituted-phenolic compounds, quaternary compounds and hypochlorites.

Illustrations, of agar-plate cultures and manufacturing plant, add to the interest of the book for the general reader, though it is doubtful whether they add much to the value of the text. The glossary of words and phrases which concludes the text may help the comprehension of a general reader; but it is far too elementary for the palate of any trained scientist. Notwithstanding these criticisms, this is a book that ought to be read by all engaged in disinfectant production and use.

PETER COOPER.

Chemist's Bookshelf

Reference Volume for Qualitative Analysis of Organic Substances

CHARACTERISATION OF ORGANIC COMPOUNDS. By *F. Wild.* 2nd edition. Cambridge University Press. 1958. Pp. viii + 306. 37s 6d.

A new edition of Dr. Wild's book on the 'characterisation of organic compounds' will be welcomed by most chemists who in the course of their work require information on suitable derivatives for completing the identification of organic substances. This is the final and perhaps most important stage in the qualitative analysis of pure organic substances and it was to fulfil a need for adequate descriptions of methods of preparing derivatives (once the compound under examination had been classified according to conventional methods of qualitative testing) and to provide tables of melting points, that Dr. Wild produced the first edition of this book in 1946. Conventional tests dealing with qualitative organic analysis must necessarily curtail too extended a treatment of this particular subject and only the more important derivatives receive any attention; even then, anomalous effects are often overlooked and tables of melting points are generally far from being complete.

The new edition contains eleven chapters: the first two deal with selection of reagents and the classification of organic substances, while the remainder deal with the preparation of suitable derivatives of organic compounds classified according to the particular functional group which may be present. Each of these chapters is similar in layout; the chemistry of the processes is first described, and this is followed by detailed procedures for the preparation of the derivatives. The chapters conclude with extensive tables listing the melting-points of all the suitable derivatives of the particular group of compounds.

In the 12 years which have elapsed since this book first appeared, a considerable volume of work has appeared in the literature on new derivatives, improvements to existing procedures for the preparation of established derivatives, and corrected melting-points. At the risk of being called hypercritical, the reviewer has found few references to such work, although the text abounds with references to what must now be called the classical work on the subject. Nevertheless, much of this more recent information must have been incorporated in the tables of melting-points, but it would be more reassuring to find concrete evidence of this by the citation of references.

Intended as a reference volume for final-year students and research workers, this book should continue to fill the gap between the chemical literature and text books of qualitative organic analysis. It can be recommended to all who are interested in the characterisation of organic compounds.

WILLIAM I. STEPHEN.

CATALOGUE OF PLANT PRODUCTS

KONSTITUTION UND VORKOMMEN DER ORGANISCHEN PFLANZENSTOFFE (exclusive Alkaloids) (Chemistry of Plant Products). By *W. Karrer.* Birkhäuser Verlag, Basle. 1958. Pp. 1207. DM.136.

The chemical study of plant materials has always been a major branch of organic chemistry. Investigations in this field have not only played a decisive role in the development of pharmacy and perfumery, but have also had vital significance for the growth of organic chemistry as a whole. Thus tartaric acid and the carbohydrates provided a nursery for classical stereochemistry and, more recently, the terpenes and steroids have played an important part in the elucidation of reaction mechanisms and the development of conformational analysis.

It is therefore surprising that the cataloguing of plant products has been so sadly neglected. Until the publication of the present volume, the only comprehensive reference book in this important field was Wehmer's 'Die Pflanzenstoffe', which was written over 20 years ago, and approaches the subject from a biological rather than chemical point of view. Many chemists will therefore be grateful to Dr. Karrer for undertaking the gargantuan task of compiling this treatise.

This book is divided into 45 sections, each of which deals with a class of organic compounds, e.g. hydrocarbons, alcohols and phenols, stilbenes, carboxylic acids, etc. (alkaloids are not included). Every section opens with a brief introduction which highlights important chemical and biological features. Within each section, the compounds are arranged partly according to molecular size and partly according to chemical similarities. This method of classification facilitates profitable browsing but it is often ambiguous; thus columbin, which is classified under 'lactones', could equally well claim a place under 'furan derivatives' or even under 'diterpenes'. However, it is not difficult to locate a compound if its name or origin is known, as there are two excellent indexes, one of compounds and one of plants. The reviewer was disappointed by the absence of a formula index, which would surely have been most useful for identification purposes.

Individual entries include alternative names, molecular and structural formulae, and brief indications of physical properties. The most important plant sources of the compound are then given and each entry is well documented with key literature references on isolation, structural determination and synthesis.

Over 2600 entries are contained in the volume, some of which refer to compounds which do not themselves occur in nature, but which are formed on hydrolysis of more complex natural products. Compounds whose complete constitution has not yet been established, are excluded. The literature has been examined up to the end of 1956 and, on the whole, the coverage is excellent. A valuable feature is the inclusion of products from moulds and bacteria, which are perhaps even more versatile in their chemistry than the higher plants. Errors and misprints are very rare, and the printing and production are excellent.

This is clearly a most useful reference book, and the reviewer hopes that its warm reception will encourage the author and the publishers to keep it up to date with regular supplements.

PETER SCHWARZ.

Chemistry of Fatty Acids

AN INTRODUCTION TO THE CHEMISTRY OF FATS AND FATTY ACIDS. By *F. D. Gunstone.* Chapman and Hall, London. 1958. Pp. x + 161. 32s.

This book is presented to the student, teacher and practising chemist as a bridge across the gap between the existing excellent but extended treatises on the chemistry of the fats and fatty acids and the perfunctory treatment generally accorded this subject in text books of organic chemistry.

The book is divided into six chapters. The first covers the occurrence, structure—including methods for the determination of structures—and synthesis of the saturated, unsaturated and branch-chain fatty acids. The next chapter similarly deals with the fats and other lipids. The third chapter is an admirably concise review of the physical properties of the fats and fatty acids. The fourth chapter covers the chemical reactions of these compounds and is subdivided into sections covering hydrolysis and esterification, hydrogenation and oxidation (including an excellent account of autoxidation) as well as thermal polymerisation, halo-derivatives and general reactions of the carboxyl group. The final chapters outline the biological role of the fats and their chief technical applications.

Modern laboratory techniques for the isolation and analysis of fats and fatty acids are described, while technical processes and problems are not neglected.

Written in a clear and logical style, the book is well produced and fulfils its stated aim. It is only to be regretted that in view of its intended market this book could not have been produced at a lower price.

M. H. BENN.

PEOPLE in the news

● SIR ALEXANDER FLECK, ICI chairman, will as president of the British Association for the Advancement of Science, accompany the DUKE OF EDINBURGH next year when he attends the annual meetings of the Indian Science Congress at Delhi and the Pakistan Association for the Advancement of Science in February. The Duke, who has accepted invitations to attend as a past president of the British Association, will also tour centres of scientific and industrial interest in both countries.

● MR. ROBERT WAYNE DEVEREUX, son of the late Col. W. C. Devereux, C.B.E., founder of the Almin Group, has been appointed sales manager of Warwick Production Co. Ltd., Birmingham Road, Warwick.

● The Minister of Power has reappointed SIR HAROLD SMITH as chairman of the Gas Council when his present term of office expires on 31 December.

● MR. CHARLES FREDERICK HUEBNER, chief buyer for British Oxygen Co. Ltd., has been elected president of the Purchasing Officers Association.

● DR. K. J. LYNES, general works manager, and MR. B. J. PAGE, secretary and controller, have been appointed directors of Pfizer Ltd., Folkestone. Dr. Lynes graduated in science at Birmingham University in 1941 and became Ph.D. in 1948. He joined the research and development department of The Distillers Co. Ltd., and from 1949 to 1954 was in the fermentation department of Glaxo Laboratories. He joined Pfizer's in 1954 as fermentation supervisor. Mr. Page is a chartered accountant who joined the company in 1954.

Dr. K. J. Lynes

● At the autumn conference of the Association of British Pharmaceutical Industry at St. Anne's-on-Sea, MR. RICHARD L. TAYLOR, managing director of Johnson's of Hendon Ltd., was presented with a gold cigarette lighter to mark the completion of 21 years' service on the council.

● Laporte Industries announce that MR. G. K. JONES has been appointed a director of their subsidiary, Fullers' Earth Union, of which he is the chief research chemist.

● MR. P. K. CLAPHAM is retiring after 24 years' service as manager of the heavy chemical sales department of F. W. Berk and Co. Ltd., chemical manufacturers, of Berk House, Portman Square, London W1. He is succeeded by MR. L. A. PLUMMER, who has been with the company for 32 years and until recently was works manager at the Stratford, London E15, plant. Berk's heavy chemical sales department at Stratford is to be reorganised and products handled will include liquid sulphur.

● MR. E. G. FAIRBURN, chairman and managing director of Darlington Chemicals Ltd., has been elected chairman of the Northern Regional Council of FBI. He succeeds MR. D. G. BROWN of the Redheugh Iron and Steel Co. Ltd.

● MR. S. H. ELLIOTT, managing director of H. J. Elliott Ltd., E-Mil Works, Treforest, South Wales, is touring the US, Canada and Mexico by air to visit distributors and stockists of his firm's products —volumetric laboratory glassware, thermometers, hydrometers and viscometers. He will be away about six weeks.

● Manchester Oil Refinery (Holdings) announce that DR. GEORG TUGENDHAT has ceased to hold his office of managing director. Dr. Tugendhat, however, remains a director of the company. He was appointed managing director in January 1957, on his resigning the position of deputy chairman.

● SIR HUGH WARREN has been appointed a director of British Industrial Plastics.

Dr R. F. Webb, B.Sc., Ph.D., formerly a lecturer at Cambridge University has joined the staff of CIBA (ARL) Ltd., Duxford, where he will direct specialist groups engaged in long-term research in new plastics

● George Kent Ltd., industrial instrument makers, of Luton, Bedfordshire, announce the appointment of MR. F. J. HAVENITH to the board of their Belgian subsidiary, Kent-Continental SA, as local resident director. Mr. Havenith has been the manager, first of Kent's Brussels office and subsequently of the Belgian company, since its formation. In addition to his work in the Belgian market, Mr. Havenith has direct supervision of Kent offices and activities in Germany and Holland and is working in close contact with the agents in Switzerland, Messrs. Socsil of Lausanne.

● MR. F. CORKER, assistant secretary of the Staveley Iron and Chemical Co., has been appointed secretary. MR. A. E. BIGGS has resigned as secretary but will remain an executive director with special responsibility for financial matters. MR. E. FREER, foundries general manager, has been appointed to the board.

Five Chemists Win DSIR Research Fellowships

FIVE of the fourteen research fellowships awarded this year by the DSIR to 'young research workers of exceptional promise who, usually, have already received post-graduate training up to the level of a doctorate' have gone to chemists.

They are Mr. J. Biggs (Cambridge), Dr. C. J. S. M. Simpson (Cambridge), Dr. Amy M. Goodall (University College, London), Mr. B. Nicholls (Queens University, Belfast), and Mr. G. E. Hall (Technische Hochschule, Zurich).

Arbitration on KID Listing of Polymers

COMPLAINTS that certain polymers had been improperly excluded from KID List J (a supplementary list of synthetic organic chemicals) have been referred to an arbitration tribunal. The polymers concerned are polythene; polymethyl methacrylate; polystyrene; p.v.c.

The tribunal will consist of a referee appointed by the Lord Chancellor and two members selected by him from a panel of 'persons of special scientific attainments appointed by the President of the Board of Trade'.

The arbitration will be open at 10.30 a.m. on 3 November at Court B, Judge's Quadrangle, Royal Courts of Justice.

Balfour Group's Sales Drive by Air Abandoned

THE SUDDEN death of Mr. Gordon L. R. Pearce in West Africa on 6 October has led to the abandonment of the 22,000 miles tour of Africa which he was undertaking with Mr. R. J. Hannaford on behalf of the Balfour Group of Companies, Leven, Scotland. Mr. Pearce was the senior technical representative for the chemical industry of Enamelled Metal Products Corporation (1933) Ltd. Mr. Pearce and Mr. Hannaford were shown in CHEMICAL AGE last week (page 604) with the Percival Prentice aircraft in which they were flying from Southend Airport. Mr. Pearce was acting as navigator. His death was not the result of a flying accident.

Obituary

MR. CECIL C. MASON, O.B.E., director of the Cambridge Instrument Co. Ltd., and managing director between 1910 and 1941, has died at the age of 77.

Commercial News

- Laporte Halve Interim on Doubled Capital
- Pulsometer Negotiate for Two Companies
- New Company to Make Minimum-iron Finish
- Pfizer Italiana Announce Loss for 1957

British Petroleum

At the recent meeting of the British Petroleum Co., resolutions were passed to create 50 million £1 shares, to capitalise £101,200,670 of reserves, and to distribute one ordinary share for each £1 unit of ordinary stock held.

Laporte Industries Ltd

An interim dividend of 2½ per cent, less income tax, has been declared by Laporte Industries Ltd. This dividend is payable on the ordinary capital as doubled by a one-for-one bonus issue in July 1958, and is comparable with the interim dividend of 5 per cent actual, less tax, paid on 30 November 1957.

Oxley Engineering

Group net profit of Oxley Engineering Co. recovered from £33,703 to £77,759 in the year ended 30 June 1958, and compared with £94,401 in 1955-56. Tax charged was £81,708 against £41,194 in 1956-57.

Dividend is being maintained at 10 per cent. A special interim of 4 per cent on account of the current year is being paid.

Oxley Engineering manufacture electrically welded purifiers, storage tanks and gasholders. Chemical plant is also manufactured and erected.

Pulsometer Engineering

Pulsometer Engineering Co. (pumping, filtering and refrigerating engineers) announce that negotiations are in an advanced stage for the acquisition of the entire capital of B.A.L. and of J. Caslake to be satisfied by an issue of £700,000 of debenture stock and approximately 165,002 ordinary 5s shares. Both these companies manufacture specialised equipment for the oil industry.

In anticipation of the acquisition of B.A.L., the principal shareholder and managing director of that company, Mr. E. Sanders has been elected to the board of Pulsometer and appointed managing director. Mr. P. J. Lachelin has also been appointed to the board and appointed deputy chairman, while Mr. D. E. Webb has resigned from the board.

Turnover of the Pulsometer group is reported as having been maintained but profits for the first six months of the current year showed some decline. In anticipation of an improvement during the second half of the year, an interim dividend of 7½ per cent is declared.

Warwick Chemical

The Warwick Chemical (Yorkshire) Ltd. has been formed with a capital of £25,000 to manufacture resin-forming formaldehyde and non-formaldehyde condensates for the treatment of textile materials and to produce retentive minimum iron finishes from the product 'Prym C R'. The directors are: N. E. Alexander, W. E. Fullerton and S. Z. Krinsly (nominated by the Sun Chemical Corporation) and J. G. Evans and T. S. Naylor, Parkfield, Melmersby, Ripon (nominated by Bradford Dyers' Association Ltd.).

German BP

BP Benzin und Petroleum, a wholly-owned subsidiary of British Petroleum, has increased its capital by another DM 35 million to DM 200 million. In September the capital was raised by DM 45 million to DM 165 million. The increases were necessary to cover investment projects, the company stated.

Pfizer Italiana

Pfizer Italiana SA, Rome, have declared a loss for the financial year ended 30 November 1957 of 37 million lire (about £21,322). The company, with a share capital of 490 million lire, made a profit for the previous year of 148 million lire.

NEW COMPANIES

LABRECQUE ENGINEERING CO. LTD. Capital £1,000 To carry on the business of mechanical, civil, chemical and general engineers, etc. Directors are Leonard P. Smith (permanent), 115 Pepys Road, London, SW10, Kenneth J. C. Williams, 14 Ponlett Gardens, Twickenham, Middlesex, and Alan J. Pickett. Secretary: K. J. C. Williams. Reg. office: Taywood House, Tayfere Street, London, SW1.

PRESS-CHEM LTD. Cap. £1,000. Chemical manufacturers, chemical engineers and sundriesmen. Reg. office: 45/7 Park Road, East Acton, London W3.

GEO. W. ROWLEY AND CO. LTD. Cap. £20,000. Manufacturers of and dealers in organic, chemical and compound fertilisers and animal feeding stuffs. Directors: Mrs. Sarah Taylor, 23 Garthdale Road, Liverpool 18; Reginald A. Parkes, 23 Hillfield Drive, Pensby, Ches; Elsie Taylor, Helen M. Taylor and Reginald Hetherington.

Procedure for Changes in Permitted Food Colours

AN announcement by the Ministry of Agriculture, Fisheries and Food states that the Government is prepared to consider proposals for individual colours to be added or removed from the permitted list now embodied in the Colouring Matter in Food Regulations, 1957 (SI No. 1066) and the Colouring Matter in Food (Scotland) Regulations, 1957 (SI No. 1123).

The procedure, which has now been outlined, will enable the list to be modified in the interim period of five years should new developments in colour manufacture or food processing, or fresh evidence relating to the safety or otherwise of colours make this desirable.

All proposals should be addressed to Assistant Secretary, Food Standards, Hygiene and Slaughterhouse Policy Division, Ministry of Agriculture, Fisheries and Food, London SW1, or to Secretary, Department of Health for Scotland, St. Andrew's House, Edinburgh, 1.

Market Reports

MODERATE VOLUME OF NEW TRADE

LONDON Steady conditions and a firm undertone characterise most sections of the industrial chemicals market but the volume of new business remains of moderate dimensions. However the movement into consumption against existing commitments is keeping well up to schedule, and contract replacement buying together with an expanding home demand is looked for in the near future.

The call for agricultural chemicals continues quiet. Export trade in chemicals has been maintained at about recent levels despite the necessity for competitive prices. Business in the coal-tar products market is moderately good for the period with an improving demand for pitch on home and export account.

MANCHESTER Prices on the Manchester chemical market were steady to firm with little sign of any reaction, and apart from the textile and allied industries reasonably good deliveries are being taken against contracts. Replacement buying generally extends over a shorter period than usual. Shipping business continues firm.

GLASGOW A reasonable volume of business was maintained during the past week in the Scottish heavy chemical market. Demands showed little variation in regard to quantities which were consistent with normal requirements; although the majority were against current requirements, in some directions forward deliveries were in evidence.

There was a trend to firmness in regard to prices. On the agricultural side demands are particularly quiet, but some interest is now being shown regarding needs for next season.

TRADE NOTES

Representatives for Asbestos

Gordon Felber (Asbestos) have been appointed to represent National Asbestos Mines of Quebec (a subsidiary of National Gypsum Co. of US), for the sale of asbestos fibres in the UK, Western Germany, Italy, Spain, Portugal and Israel.

Protective Flooring

Main protective work at Associated Ethyl's new chlorine plant (see p. 635) was carried out by F. Haworth (ARC) Ltd., Buckingham Palace Road, London SW1. The flooring in all the processing departments is protected by acid-resisting bricks and tiles bedded and jointed with Essar (W) resin cement laid on membranes of acid-resistant asphalt. In the brine filtration building where alkaline conditions prevail, the concrete floor was first covered with a special plastic membrane based on polyisobutylene and covered with acid-resistant bricks set in supersulphate cement.

Solartron Subsidiary Moves

The office of the German company of the Solartron Electronic Group Ltd., Thames Ditton, Surrey—Solartron GmbH—is now at Bayerstrasse 13, Munich.

Polythene Letters

A range of polythene letters produced for use in moulding patterns is now available from Aldridge Plastics Ltd., 155 Charing Cross Road, London WC2.

Cheaper UK Quicksilver

London ex-warehouse quicksilver price is now indicated at about £78 per flask, compared with £79 previously. This is the first change for nearly three months.

Newton Chambers' Agreement

A long-term agreement has been signed between Newton Chambers and Co., Sheffield, and Gottfried Bischoff AG, Essen, Germany, for the sale, manufacture and installation of the whole of the Bischoff range of plants within the UK and Eire. Some 60 high-pressure gas purification plants and by-product plants have been constructed by Bischoff.

Under the agreement, Newton Chambers will have the benefit of the German company's experience in recent years.

'Spectropolarimetry Meeting'

The meeting on 'spectrometry' held at Courtaulds Hall, Queen Elizabeth College, University of London, at which Dr. M. K. Hargreaves, Dr. W. Klyne and Mr. A. C. Parker presented papers (Diary Dates, 11 October, p. 609) was held under the auspices of the Photoelectric Spectrometry Group and not under the Society for Analytical Chemistry. Hon. Secretary of the Photoelectric Spectrometry group is K. A. Macdonald, M.A., Arbury Works, 56 Arbury Road, Cambridge.

DIARY DATES

MONDAY, 20 OCTOBER

SCI—London: 14 Belgrave Square, SW1. 5.30 p.m. 'The preservation of timber' by Dr. R. C. Fisher and Dr. W. P. K. Findlay

TUESDAY, 21 OCTOBER

I.Chem.E.—London: Geological Soc., Burlington House, Piccadilly, W1. 5.30 p.m. 'Exploratory study of the flow of granules through apertures' by R. L. Brown and J. C. Richards.

RIC—London: SE Essex Tech. Coll., Dagenham. 6.30 p.m. 'Infra red analysers and spectrometers' by Dr. A. E. Martin, Ph.D., D.Sc.

SAC—Sheffield: British Iron and Steel Research Assn., Hoyle Street. 7 p.m. 'Determination of gases in metals by micro-vacuum fusion' by E. Booth, B.Sc., and 'The determination of oxygen and hydrogen in steel' by C. E. A. Shanahan, B.Sc., F.R.I.C.

National Chemical Laboratory—Teddington, Middlesex. Open day (and Wednesday). 10 a.m. to 1 p.m. and 2.30 p.m. to 5.30 p.m.

THURSDAY, 23 OCTOBER

SCI—Liverpool: Donnan Lab., The University. 7.30 p.m. 'Determination of carbonylic oxidation products in edible fats and foods' by C. H. Lea, D.Sc., Sc.D., F.R.I.C., and P. A. T. Swaboda, Ph.D.

Changes of Address

The Scottish office of Witco Chemical Co. Ltd., Bush House, Aldwych, London WC2, has been transferred to 62 Robertson Street, Glasgow C2.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On Sale 12 November or as soon as possible thereafter

Homogenous solutions of polymers or copolymers of acrylonitrile. Vereinigte Glanzstoff-Fabriken AG. **701 469**

Fuels and lubricants for internal combustion engines. Shell Refining & Marketing Co., Ltd. **737 092**

ACCEPTANCES

Open to public inspection 19 November

Catalysts for the catalytic production of polymers. Phillips Petroleum Co. [Divided out of 804 641.] **804 642**

α-Methyl-α-phenylsuccinodinitrile and a process for producing N-methyl-α-phenyl-α-methylsuccinimide. Parke, Davis & Co. **804 456**

Apparatus for separating granular materials having different specific gravities by means of a liquid. Tromp, K. F. **804 616**

Steroids and the preparation thereof. Pfizer & Co., Inc., C. [Divided out of 804 521.] **804 522, 804 523**

Filtering apparatus. Spodig, H. **804 638**

Isolation of chlorosulphonated polymers of ethylene. Du Pont de Nemours & Co., E. I. **804 535**

Methods of packaging solid benzene hexachloride. Columbia-Southern Chemical Corp. **804 742**

Compositions for flameproofing cellulosic material, their use, and material treated therewith. Geigy, AG., J. R. [Addition to 790 663.] **804 745**

Polyester resin and electrical conductors coated therewith. General Electric Co. **804 683**

Production of carotenoid-containing oils. Brinckman, M. J., Brinckman, jun., M. J., Sydow, K. V. Von, and Mergell, C. [trading as Harburger Oelwerke Brinckman & Mergell]. **804 685**

Dentifrice compositions containing stannous tin compounds. Hedley & Co., Ltd., T. **804 486**

Preparation of unsaturated polyester resin mixtures. Beck, Koller & Co. (England), Ltd. **804 537**

Purification of lactams. Inventa Aktiengesellschaft Für Forschung Und Patentverwertung. **804 686**

Thiophosphoric acid esters. Farbenfabriken Bayer, AG. **804 538**

Fluorinated organic dithiophosphates and their use as anti-wear agents in lubricating oil compositions. Esso Research & Engineering Co. **804 777**

Thiochromones. Farbenfabriken Bayer, AG. [Addition to 803 803.] **804 689**

Manufacture of adrencorticotropic hormone preparations. Organon Laboratories Ltd. **804 639**

Water soluble thermoplastic cellulose ether compositions. Dow Chemical Co. **804 749**

Vitamin B_1 preparations and method of obtaining same. Parke, Davis & Co. **804 750**

Preparation of manganese-bismuth alloys. Western Electric Co., Inc. **804 540**

Open to public inspection 26 November

Method of separating plutonium. Goldschmidt, B. L., Hardwick, T. J., and Cook, L. G. **805 000 & 805 001**

Treating wool, wool goods or wool-containing goods to reduce their tendency to felting. Wool Industries Research Assoc. **804 781**

Method of separating plutonium. Brown, H. S., and Hill, O. F. **804 999**

Bleaching of bread. Research Assoc. of British Flour-Millers, Moran, T., Pace, J., and McDermott, E. E. **804 914**

Measurement of moisture or other vapour concentrations. Council for Scientific & Industrial Research. **805 051**

Detecting the presence of impurity in a liquid. Stream-Line Filters, Ltd. **805 004**

Composite synthetic artificial filaments. Du Pont de Nemours & Co., E. I. **805 033**

Plating with titanium, zirconium or alloys thereof. Goldenberg, L. **804 814**

Oxidation-resisting material. British Thomson-Houston Co., Ltd. **805 068**

Production of metallic coatings. Dehydag Deutsche Hydrierwerke G.m.b.H. **804 833**

Production of ion-exchange resins. Permutit Co., Ltd. **804 782**

Preparation of hydrogen peroxide. Columbia-Southern Chemical Corp. **805 101**

Process and apparatus for leak detection in vacuum vessels. Egyesult Izzolampa es Villa-Mossagi, R. T. **805 034**

Filled natural or synthetic rubber and other elastomers (plastics, paper, fabric and leather. Deutsche Gold- und Silver-Scheideanstalt Vorm. Roessler. **804 834**

Production of phosphoric acid and alkali metal and ammonium phosphates. Food Machinery & Chemical Corp. **805 006**

Production of steel by the basic Bessemer process. Ziegler, K. **804 886**

Method and apparatus for preparing solid silicon monoxide. Goodrich Co., B. F. **804 991**

Modified silica aerogels and silicone rubbers containing same. Monsanto Chemical Co. **805 102**

Oxygen-silicon containing compositions, preparation and use thereof. Goodrich Co., B.F. **804 992**

Reinforcement of natural or synthetic rubber. Goodrich Co., B. F. **804 993**

Process and apparatus for heating viscose. Celanese Corp. of America. **804 881**

Rubbery pigments. Goodrich Co., B. F. **804 994**

Halogenation of normally gaseous olefins. Associated Ethyl Co., Ltd. **804 995**

Method of and apparatus for concentrating a comminuted material in a mixture of such materials. Spencer, R. V. **804 919**

Polymerisation process. Minnesota Mining & Manufacturing Co. **805 103**

Production of aluminium-containing synthetic resins. Chemische Werke Albert. **804 981**

Electrolytic production of chlorine and an aqueous solution of lithium hydroxide. Olin Mathieson Chemical Corp. **804 921**

Production of motor gasoline. British Petroleum Co., Ltd., and Knight, W. N. N. **805 045**

Production of atmosphere for the gaseous cementation of ferrous alloys. Wild-Barfield Electric Furnaces, Ltd. [Addition to 748 320.] **804 864**

Stabilised compositions containing simple synthetic vitamin A materials. Eastman Kodak Co. **804 984**

Acylaminopropanediols and the esters, acetals and ketals thereof. Farbenfabriken Bayer AG. **804 986**

Method of making rubber containers. United States Rubber Co. **805 106**

Tin (II) chlorofluoride and tin (II) monochlorotrifluoride. Indian University Foundation. **804 953**

Mixer-settler apparatus for liquids. UK Atomic Energy Authority. **805 011**

Tropane derivatives. Sandoz, Ltd. **804 837**

Apparatus for mixing liquids. Waddington, R. S., and Duval, B. **805 046**

Hardening of epoxide resins. Chemische Werke Albert. **804 982**

Determining water in liquids of low water solubility. Ansul Chemical Co. **805 012**

Purification of hydrocarbons. Phillips Petroleum Co. **804 857**

Preparation of a fungicide based on ethylene-dithiocarbamates. Montecatini Soc. Generale Per L'Industria Mineraria e Chimica. **805 108**

Manufacture of phenols. Distillers Co., Ltd. **805 048**

Stabilised vitamin A compositions. Eastman Kodak Co. [Divided out of 804 984.] **804 985**

Plastic compositions and their preparation. Styrene Products, Ltd. [Cognate applications 11584 and 11585.] **804 956**

Binding agents and surface coating compositions modified by aluminium-containing condensation polymers. Chemische Werke Albert. **804 983**

Atomisers for liquids. Bell, C. V. **804 819**

Oxidation of paraffins. Distillers Co., Ltd. **805 110**

Hydroforming of naphthas. Esso Research & Engineering Co. **805 111**

Mixed polyesters. Imperial Chemical Industries, Ltd. **804 839**

Isocamphane compounds and processes for preparing them. Merck & Co., Inc. **804 879**

Oxazolines. Farbenfabriken Bayer A.G. **804 987**

Streptomycin and dihydrostreptomycin sulphates. Merck & Co., Inc. **805 014**

Ammonium nitrate and compositions containing same. Imperial Chemical Industries, Ltd. **805 112**

Purification of benzene. British Petroleum Co., Ltd., Housam, E. C., and Lester, R. [Cognate application 25 965.] **805 050**

Coating aluminium foil with silicone oils. Republic Foil & Metal Mills, Inc. **804 842**

Spray driers. Reavell, J. A. **805 114**

1-Phenyl-2-azidoacylamino-1.3-propane diols. Farbenfabriken Bayer A.G. **804 988**

Process and apparatus for the low temperature separation of air. British Oxygen Co., Ltd. **804 944**

Gas producing compositions. Imperial Chemical Industries, Ltd. **805 113**

Production of alkylamines. Monsanto Chemical Co. **805 018**

Purification of selenious anhydride. Soc. Generale Metallurgique de Hoboken. **805 019**

Titanate ester compositions and processes for imparting water-repellency. Monsanto Chemicals, Ltd. **804 989**

Compositions and processes for imparting water-repellency using organosilicon compounds. Monsanto Chemicals, Ltd. **804 990**

Titanium manufacture. National Distillers & Chemical Corp. **805 076**

Glass compositions. Pittsburgh Plate Glass Co. **804 930**

Glass composition. Pittsburgh Plate Glass Co. **804 893**

Preparation of high purity lithium carbonate from crude aqueous lithium chloride. Chempatents, Inc. **804 962**

Process for N, N-diisopropylbenzo-thiazole-2-sulphenamide. American Cyanamid Co. **805 021**

Hardening gelatin. Kodak, Ltd. **805 120**

Polymerising perfluorinated monomers. Du Pont de Nemours & Co., E. I. **805 115**

Indole derivatives and process for their preparation. Soc. Des Usines Chimiques Rhone-Poulenc. **804 786**

Hydroxymethyl and aminomethyl derivatives of maleic hydrazides and their salts and uses thereof as agricultural chemicals. United States Rubber Co. **805 117**

Catalysts, a process for the manufacture thereof and use thereof in a racemisation process. Hoffman-La Roche & Co. A.G., F. **804 788**

16-Alkylestratriene-3, 16. 17-triols and derivatives thereof. Searle & Co., G. D. **804 789**

Extraction of vanadium. Union Carbide Corp. **805 025**

Vinyl chloride-diakyl maleate copolymer latices. United States Rubber Co. **805 119**

Antistatic compositions and their preparation and use. Montecatini Soc. Generale per L'Industria Mineraria e Chimica **804 964**

Classifiers for the separation of solid materials in accordance with the specific gravity of the component fractions. McNutt, R. M. **805 080**

Acid catalyst separation in emulsion alkylation of olefins with isoparaffins. Esso Research & Engineering Co. **804 966**

Heat-exchange processes in hydroforming. Esso Research & Engineering Co. **804 967**

Nitrocellulose. Du Pont de Nemours & Co., E. I. **804 969**

Organosilicon compounds. Midland Silicones, Ltd. **805 028**

Purification of lysine. Du Pont de Nemours & Co., E. I. **804 970**

Recovery of acrylamide from aqueous solution. Badische Anilin & Soda-Fabrik AG. **805 029**

Process for preparing dye developers. International Polaroid Corp. [Divided out of 804 971.] **804 973, 804 974, 804 975**

Process for ripening viscose. Celanese Corp. of America. [Divided out of 804 881.] **804 882**

Process and apparatus for heating liquids. Celanese Corp. of America. [Divided out of 804 881.] **804 883**

Production of glycol mono-ethers. Soc. Des Usines Chimiques Rhone-Poulenc. **804 859**

Isocamphane compounds and their preparation. Merck & Co., Inc. [Divided out of 804 879.] **804 880**

Apparatus for conducting chemical reactions. Associated Ethyl Co., Ltd. [Divided out of 804 995.] **804 996**

Classified Advertisements

CLASSIFIED RATES: All sections 5d. per word. Minimum 8/-. Three or more insertions 4d. per word. Box Number 2/- extra. Up to 10 a.m. Tuesday for insertion same week.
SEMI-DISPLAY: 30/- per inch. Three or more insertions 25/- per inch.
SUBSCRIPTION: Annual Subscription of 52/6 brings 52 weekly copies of CHEMICAL AGE direct to your address from the printer (postage paid by the publishers), and a copy of CHEMICAL AGE DIRECTORY AND WHO'S WHO.
COMPANY MEETINGS AND REPORTS: £12.12.0 per column. Three column measure (approximately 360 words).

EDUCATIONAL

A.M.I.CHEM.E.—More than one-third of the successful candidates since 1944 have been trained by T.I.G.B. All seeking quick promotion in the Chemical and Allied Industries should send for the T.I.G.B. Prospectus. 100 pages of expert advice, details of Guaranteed Home Study Courses for A.M.I.Chem.E., B.Sc.Eng., A.M.I.Mech.E., A.M.I.Prod.E., C. & G., etc., and a wide range of Diploma Courses in most branches of Engineering. Send for your copy today—**FREE.** T.I.G.B. (Dept. 84), 29 Wright's Lane, London, W.8.

OFFICIAL APPOINTMENTS

SENIOR SCIENTIFIC OFFICERS (a); SCIENTIFIC OFFICERS (b). Pensionable posts for men and women in major scientific fields, including meteorology and geophysics (frequent overseas surveys). A few vacancies for biologists including specialised posts in taxonomy of invertebrate animals, fungus systematics, plant pathology and one post for a taxonomic botanist (Pteridophyta). Also a few posts in Home Office for Chemists and Physicists in Forensic Science field and one post for Mathematician/Physicist to work on Civil Defence problems. Qualifications: normally first or second class honours degree in science, mathematics or engineering, or equivalent attainment; additionally, for (a), at least 3 years' relevant (e.g. post-graduate) experience. Normal age limits: (a) between 26 and 31, (b) between 21 and 28 with extensions for regular Forces service and Overseas civil service. London salaries (men): (a) £1,190–£1,410, (b) £635–£1,110. Five-day week generally. Write Civil Service Commission, 30 Old Burlington Street, London, W.1, for application form, quoting (a) S.53/58, (b) S.52/58.

SITUATIONS VACANT

CHIEF CHEMIST (PAINT) required by Paint Manufacturers in COLOMBIA, South America. The successful applicant must possess good all-round experience in PAINT FORMULATION, especially in trade sales, industrial maintenance finishes and industrial product finishes, and be aged between 32 and 45.

He must possess the ability to handle and train a team of chemists, in addition to handling occasional interviews with clients.

If you possess the foregoing qualifications, and are capable of earning a salary in excess of $7,500 per annum, you should write, in complete confidence, to Box G 185 c/o Jackson's, 54 Old Broad Street, London, E.C.2.

SECOND CHEMIST (PAINT) (Formulator industrial product finishes). A Second Chemist possessing considerable professional pride in his Laboratory Work is required by a large company for work in COLOMBIA, South America.

The successful applicant for this post will be a man accustomed to tackling (and solving) a variety of problems. Age 28-35 years.

He should have a pleasing personality and the ability to work well with the company's clients.

if you possess the necessary qualifications and wish to command a salary in excess of $6,500 p.a., write in complete confidence to Box J 188 c/o Jackson's 54 Old Broad Street, London, E.C.2.

FOR SALE

Stainless Steel 180 gallon Mixing Vat.
Gardner 'G' 300 lbs. Sifter-Mixer.
Several Phos. Bronze Paste Mixers.
Gardner Jacketted Rapid Mixer 16 in. by 19 in. by 35 in. long Trough.
Werner Single 'Z' Mixer 32 in. by 23 in. by 25 in.
Change-Pan 20 gallon Mixer.
Stainless Steel 8 in. Circulator Liquid Grinding Mills.
At our No. 2 Depot, Willow Tree Works, Swallowfield, Berks.

Apply: **Winkworth Machinery Ltd., 65 High Street, Staines, Middx. Telephone: 1010.**

PHONE 98 STAINES
S.S. 'Z' BLADE ELEC: Mixer 25 in. by 25 in. by 21 in.
42 in. & 48 in. Elec: Hydros.
JACKETED 'U' TROUGH Mixer 7 ft. by 3 ft. 9 in. by 7 ft. deep.
750 GALL: S.S. Cyl: Tanks.
1,800 GALL: GLASS LINED Cyl: Enc: Tank—12 ft. by 5 ft. 6 in.
TANKS UP to 26,500 gall: **PUMPS, AUTOCLAVES. PANS, STILLS, CONDENSERS, RECEIVER, OVENS, CRUSHERS, ETC.**

HARRY H. GARDAM & CO. LTD.,
100 CHURCH STREET, STAINES.

NEW 24" AIRSCREW BLOWERS
4" delivery, 3/4 H.P. Motor, 230/250 Volts, 3 Phase, 50 cycles. £22-0-0 Each.

THOMPSON & SON (MILLWALL) LIMITED
LONDON E.14. Tel: East 1844.

MONO PUMPS H4/1½ in., stainless steel. Sigmund Centrifugal HL4/2½ in., vee-pulley; 2 in. Rotary Geared Pump, gunmetal case. Duplex Steam Pumps 3/2/3 and 4½/2¾/4. Exhaust Fans, 6 in. intake, steel-cased.

WELDING, SAXONE BUILDINGS, TARLETON STREET, LIVERPOOL.

CHLORINATION PLANT by Wallace & Tiernan.
Automatic Intermittent operated.
Type S.A. A.H.S.V. Max. capacity 2,000 lb. of Chlorine per day.

THOS. W. WARD LTD.,
Works Dismantling Dept., Albion Works, Sheffield.

BOX NUMBERS: *Reply c/o "Chemical Age" · Bouverie House · Fleet Street EC4.*